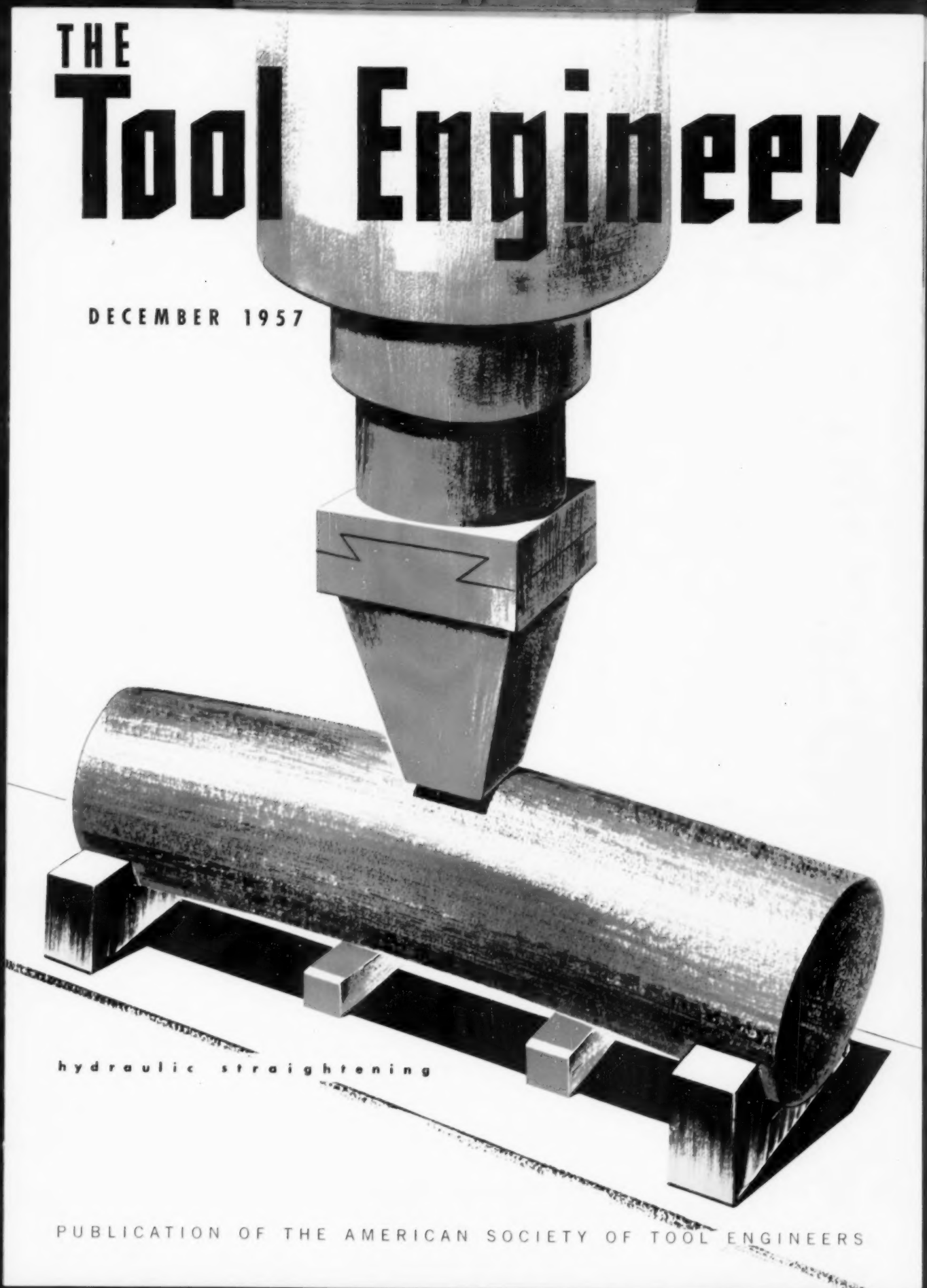
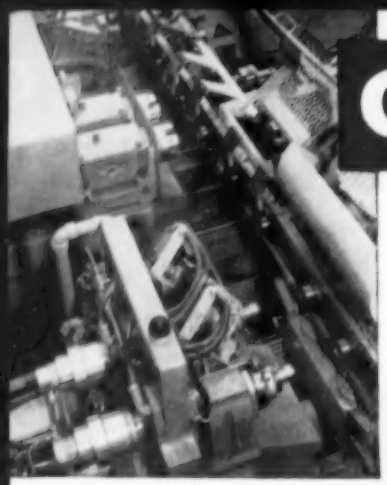
THE Tool Engineer

DECEMBER 1957



hydraulic straightening

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS



Q Where does Heald automation BEGIN

... and where does it END?

A *Wherever you want— from rough casting to finished part!*

THE EXTENT to which you apply automation in your plant is largely a matter of production economics. But whether your automated lineup consists of two stations or twenty, Heald can do the whole job from start to finish.

Perhaps, like some other men in metalworking management, you look upon Heald Bore-Matics as strictly high-precision machines that couldn't (or shouldn't) be used for *roughing* operations. Actually, Heald Bore-Matics can be and have been designed most successfully, to provide whatever degree of precision you need—from drilling, reaming, tapping, slotting, rough boring, turning and facing, etc., to any combination of precision-finishing operations.

To precision specialists roughing operations present no problems and, of course, the precision operations are taken in stride.

On any automated job, make it Heald all the way—from rough casting to precision-finished part.

It PAYS to come to Heald for the completely automated job

This 7 station Heald Bore-Matic performs 35 operations on a drum and sleeve assembly in a fully automatic cycle, as follows:

Sta. 1. Drill 6 angular holes and 2 opposed holes in hub.

Sta. 2. Bore, face, turn and chamfer 8 surfaces on flange and hub.

Sta. 3. Turn and face 9 different flange surfaces.

Sta. 4. Face 2 spots on flange.

Sta. 5. Bore, face and groove 5 different surfaces in hub and flange.

Sta. 6. Insert bronze bushing inside hub.

Sta. 7. Finish bore bushing and finish turn hub.

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THE **HEALD** MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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COVER: Controlled power, as exemplified by this straightening press, is one of the outstanding characteristics of hydraulically powered machine tools and equipment. The article starting on page 81 is an introduction to the subject of hydraulic power systems and their components.

The Tool Engineer

Volume XXXIX, No. 6 December 1957

TECHNICAL ARTICLES

Blessed Be Our Opportunities . . . . . By H. E. Collins 71
Supervisory Development Programs . . . . . By G. E. Keegan 73
Gadgets 78
Hydraulics for the Tool Engineer (Part I) . By H. L. Stewart and J. M. Moritz 81
Designed for Production 86
Putting Honeycomb Scrap to Work . . . . . By Jack Lewis 91
Facing at Constant Cutting Speed . . . . . By Max Kronenberg 93
Heat Treating in Punch and Die Manufacture . . . . By J. H. Bockrath 96
Tools at Work 100
Planning Barrel Finishing Operations . . . . . By R. F. Enyedy 105
How To Reduce Diamond Wear . . . . . By L. H. Cook 108
Saving with Homemade Tools . . . . . By S. J. Meno 109
Ultrasonic Welding . . . . . By T. W. Black 111
Measuring Cutting Forces . . . . . By Pietro Chiesorin 114
Formulas for Facing Tools (Reference Sheet) . . . By Allen M. Johnson 121

ANNUAL EDITORIAL INDEX (Vols. XXXVIII, XXXIX) . . . 271

ASTE NEWS

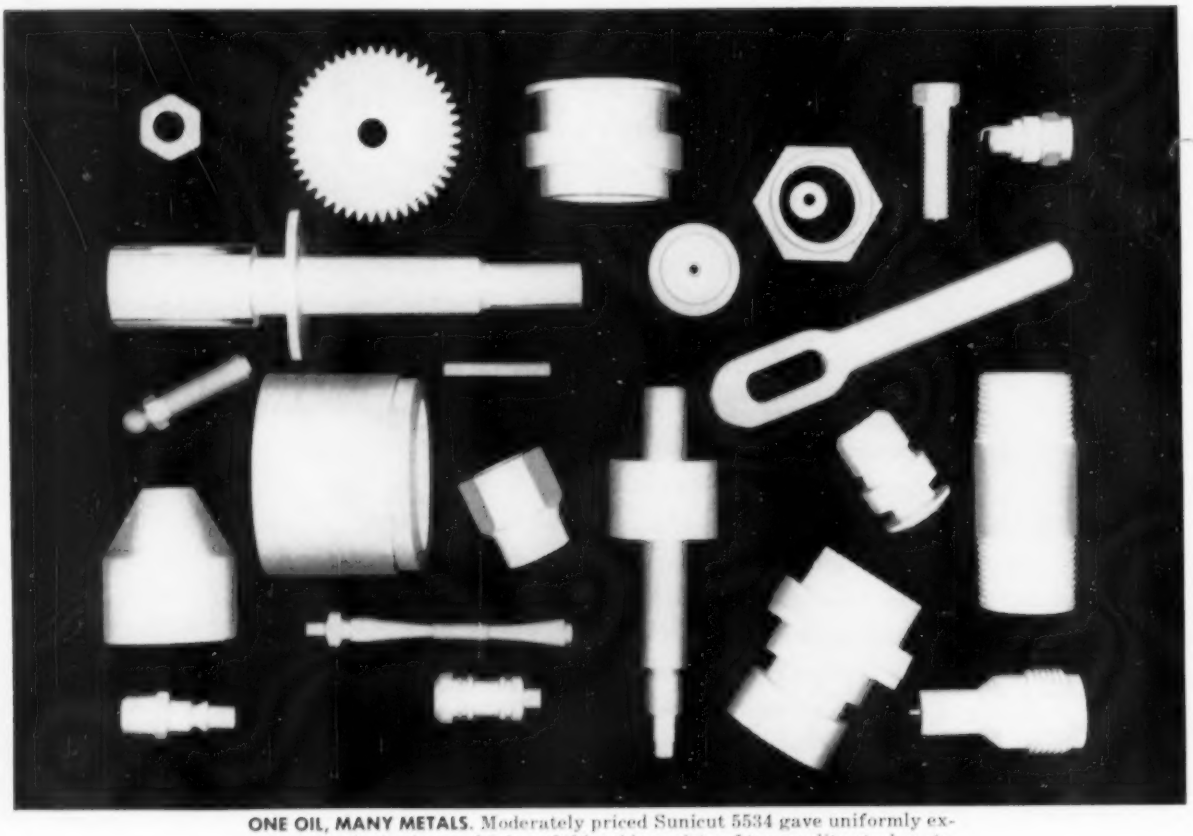
Featured This Month 124
Directors Convene for Semiannual Meeting 125
November: Industry and Education Month 126
Bradley Conference Success Story 128
Leadership Conference Goes Annual 134

DEPARTMENTS

Abstracts of Foreign Literature 171
Field Notes 177
Good Reading 190
Letter from the Editor 3
Men at Work 183
Progress in Production 147
Tech Digests 193
Technical Shorts 181
Tools of Today 151
Trade Literature 187
Who's Meeting and Where 185

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*



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A Time for Confidence

As the old year draws to a close, it is time to take stock of business conditions, present and future. For some, the year 1957 was a time of peak production. Although boom conditions have abated, we can look forward to the future with confidence.

There is every reason for optimism because, in the long run, the trend is toward higher production and continued growth of all manufacturing enterprises.

The population of the United States is growing at a faster rate than that of India and this expanding market calls for an expanding industry.

Short-term slowdowns in business should not blind us to our opportunities in a growing economy. On the contrary, they give us an opportunity to indulge in planning for the future.

One aspect of that planning should be the study of ways to keep costs down. Seller's markets have been a thing of the past for some time. The buying public—now and in the future—may or may not be stimulated by face-lift model changes or added chrome.

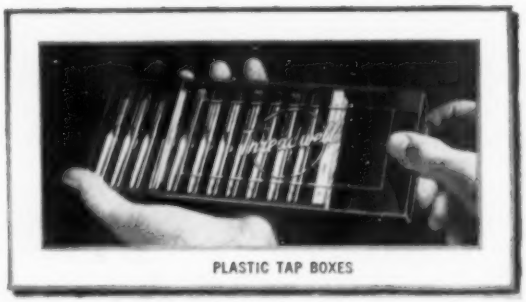
But the buying will always be stimulated by lower prices. These lower prices will be made possible by lower manufacturing costs.

Now is the time to plan for new machines and equipment. Now is the time to plan expanded facilities for expanded markets.

This is a time for confidence. The future belongs to those who are confident of future growth—plan for it now!

Theodore W Black

ASSOCIATE EDITOR



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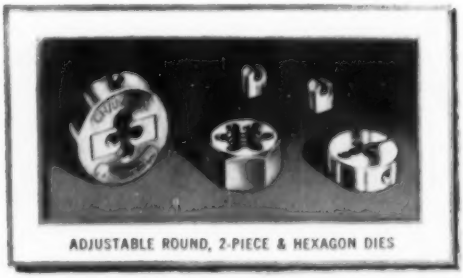

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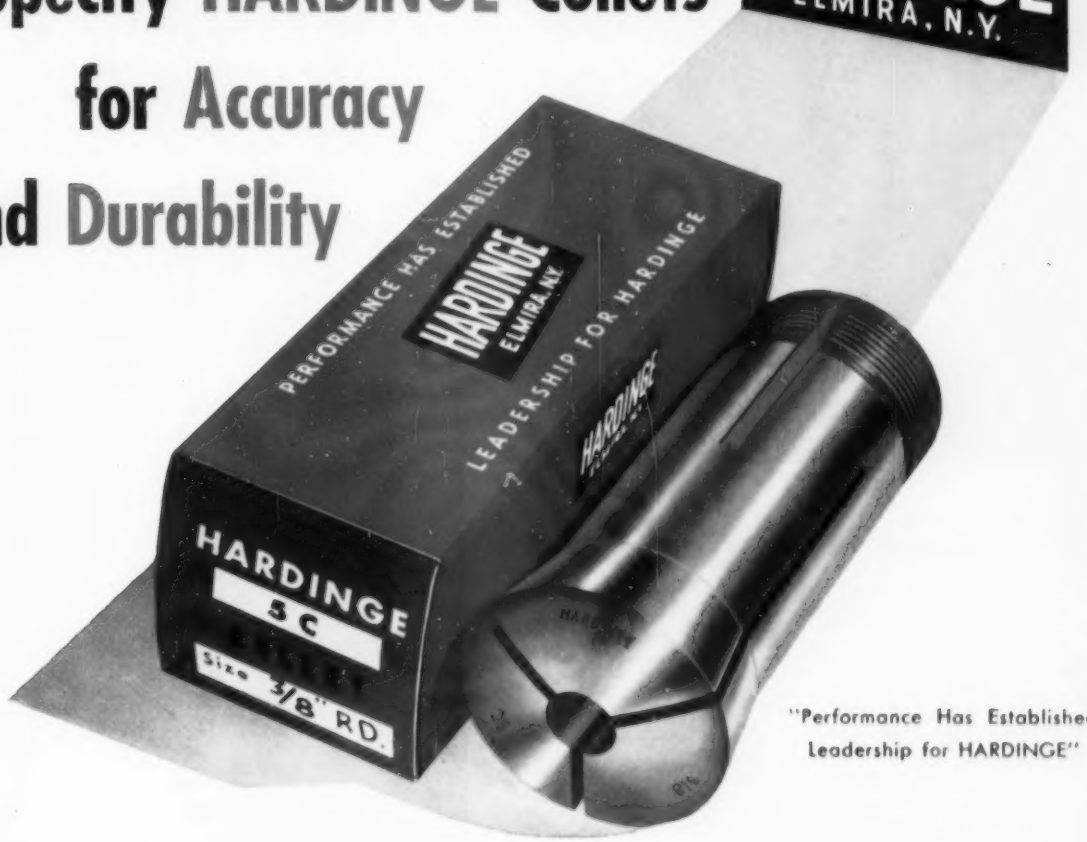

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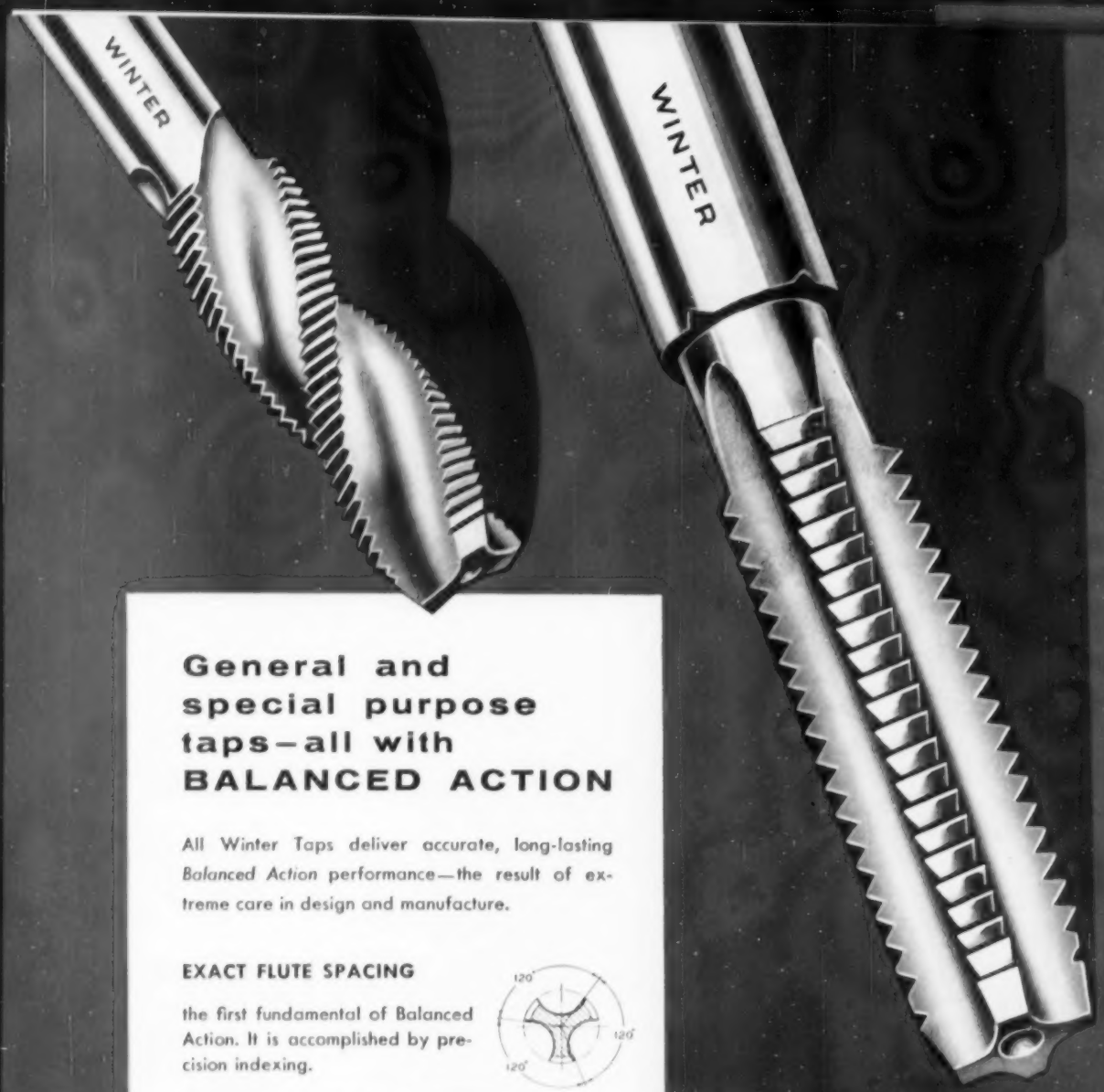

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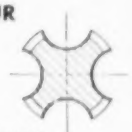

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exact to size, shape, and position —formed to give the finest performance.

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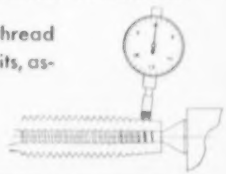
holding shank, chamfer, and thread concentricity to very close limits, assures hole-accuracy.



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maximum PRECISION or ECONOMY

"Threading Efficiency" requires the selection of the proper die head for the job to be done, and is the essence of LANDIS design. To ensure that you may use the most efficient threading tool, LANDIS manufactures Die Heads in two basic styles:

HARDENED-AND-GROUND HEADS should be used where a high degree of thread-cutting accuracy is required. Their fundamental design and the inherent qualities of specially selected and hardened materials provide the maximum rigidity necessary for threading to Class 4 and Class 7 tolerances.

HEAT-TREATED HEADS are designed for the utmost economy when doing commercial threading, and will produce threads to Class 2 and 3 fits. The initial cost is small and rugged construction ensures trouble-free operation and few repairs. Wide range coverage requires minimum tool inventories, and along with the use of LANDIS Tangential Chasers allows maximum output per dollar of tool cost.

LANDIS Tangential Chasers are an important factor both in the economy and precision of these basic head styles. These chasers may be replaced or re-ground singly, can be used for 80% of their original length, and allow either style of die head to produce threads of the accuracy for which it is recommended.

LANDIS manufactures more than 100 sizes and types of standard and special Die Heads for use on threading machines, turret lathes, tapping machines and bar automatics. Let us suggest the Head most suitable for your needs—send specifications and ask for Bulletins F-80 and F-90.

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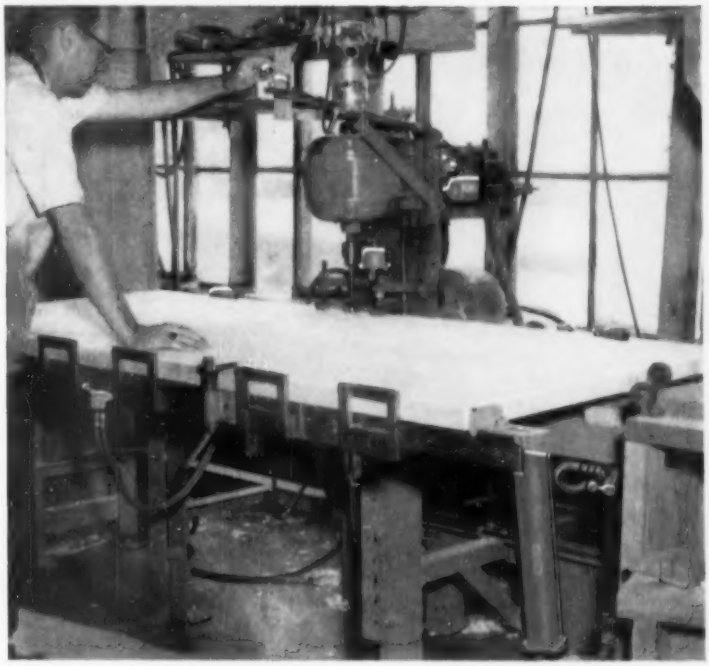
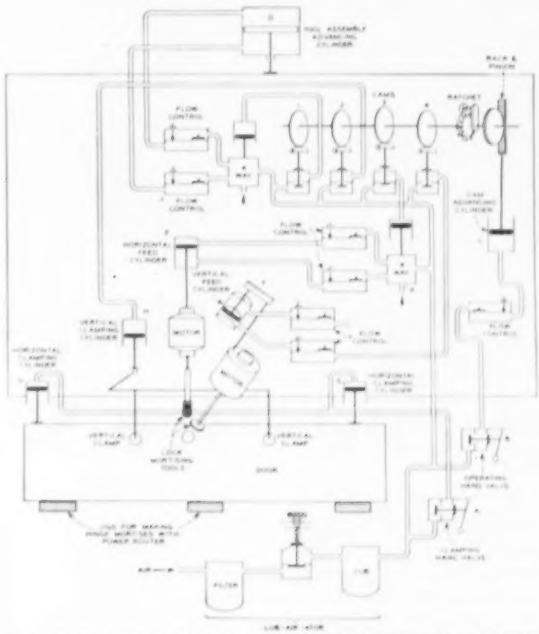
453

***Progress** in plan-it-yourself air systems:*

You can use Schrader Air Products to produce faster at a lower cost



A revolutionary building trend—pre-hung doors—means tremendous savings. Doors and frames are mortised for lock sets and hinges, assembled. This schematic shows how the door is prepared.



Air is a *natural* for many operations in processing, handling and other multi-step production . . . even to mortising doors in the woodworking field. Every day air's speed, simplicity and safety are effecting new production records.

Here's an example:

At a prominent Western woodworking company, Schrader Air Products are used on the door-mortising machine to clamp work in place, advance programming cam, and actuate all tool feeds. The machines work with extreme precision and the speed and economy of the operation are spectacular.

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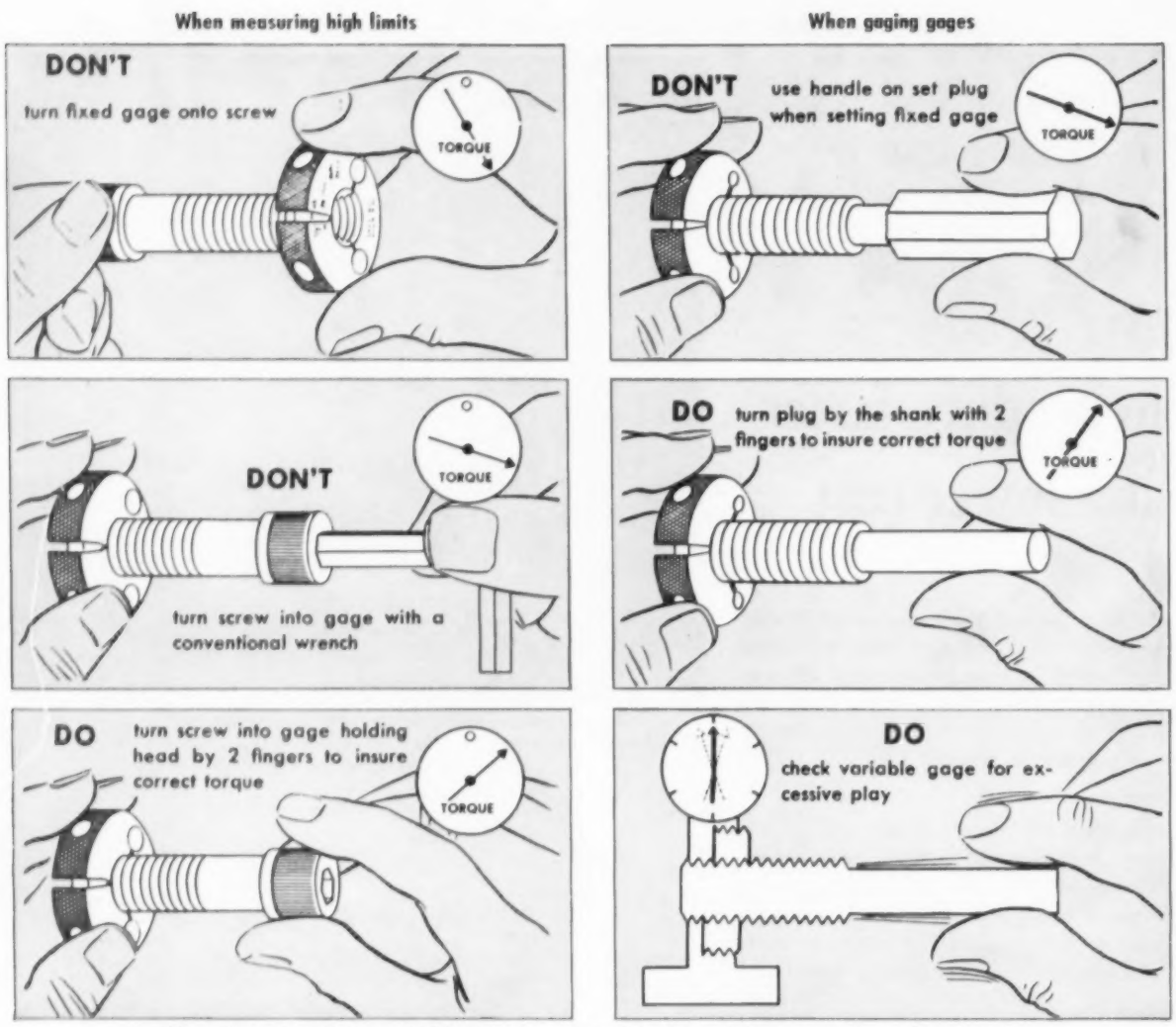

These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 37, Pa.

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Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

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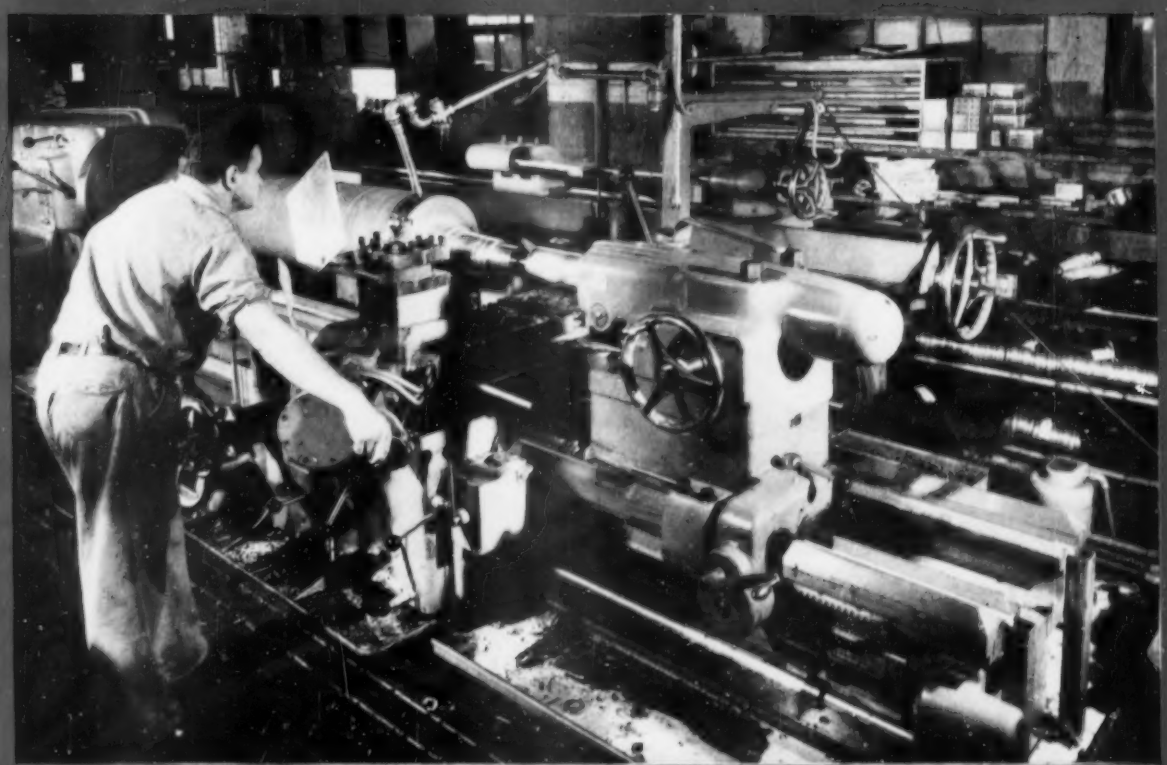


R. Hoe & Co. Inc., New York world renowned manufacturers of printing presses, has actually accomplished this in the machining of their impression cylinders.

Using a 32" "AMERICAN" Hydraulic Tracing Lathe, the cylinder journal shapes are generated from a template and the 15" diameter cylinder body is turned straight without the template control.

The all-hydraulic tracing unit in combination with the accuracy and rigidity inherent in "AMERICAN" lathes insures the highest quality of work both from the standpoint of accuracy and fine finish.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

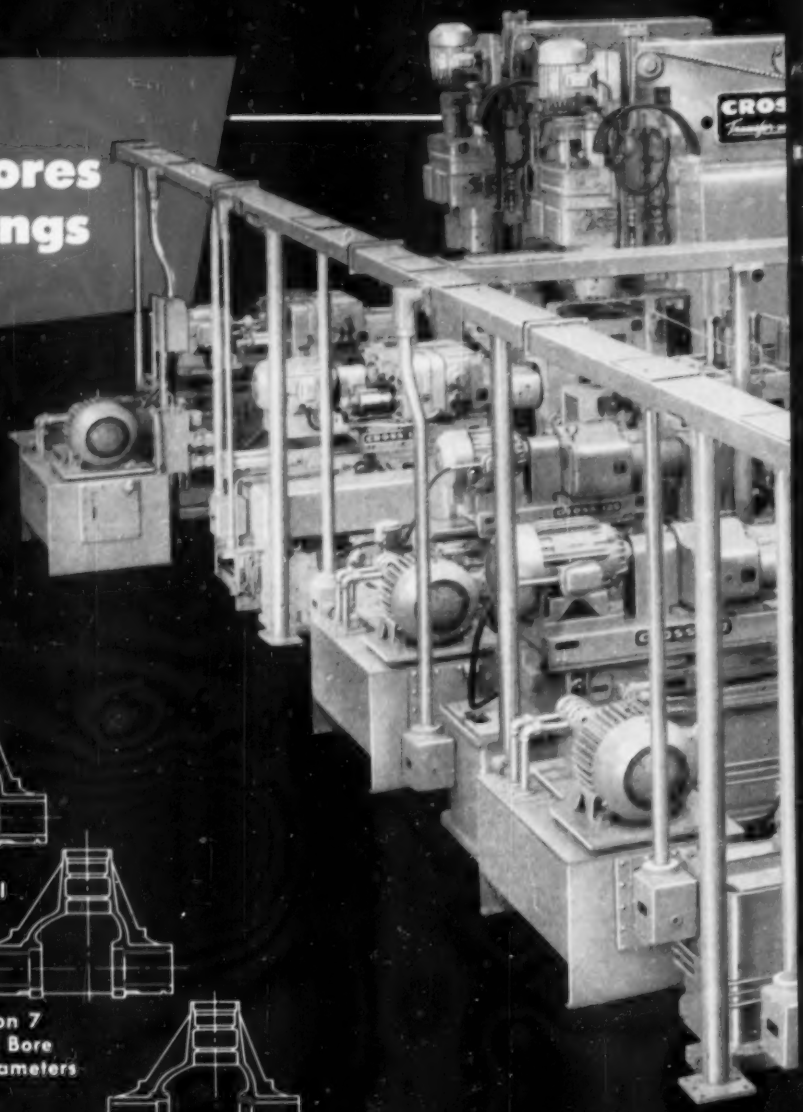
More production per man hour is the answer and the only answer to spiraling costs—modern, high production machinery is the answer to greater production per man hour.

Bulletin No. 135 gives a complete description and shows many examples. It's yours for the asking.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

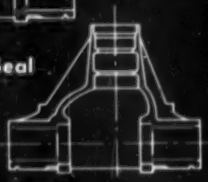
LATHES AND RADIAL DRILLS

Precision Bores Axle Housings



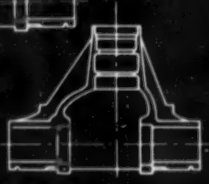
Station 11
Finish Bore
Four Bearing Seats

Station 9
Semi-Finish Bore Oil Seal
and Bearing Seats

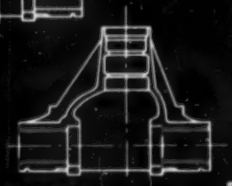


Station 7
Finish Bore
Tube Diameters

Station 5
Rough Back-bore
Right Side

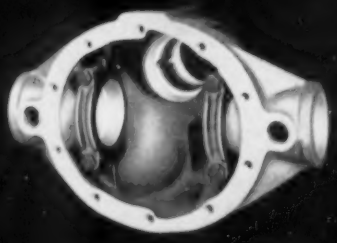


Station 4
Rough Back-bore
Left Side



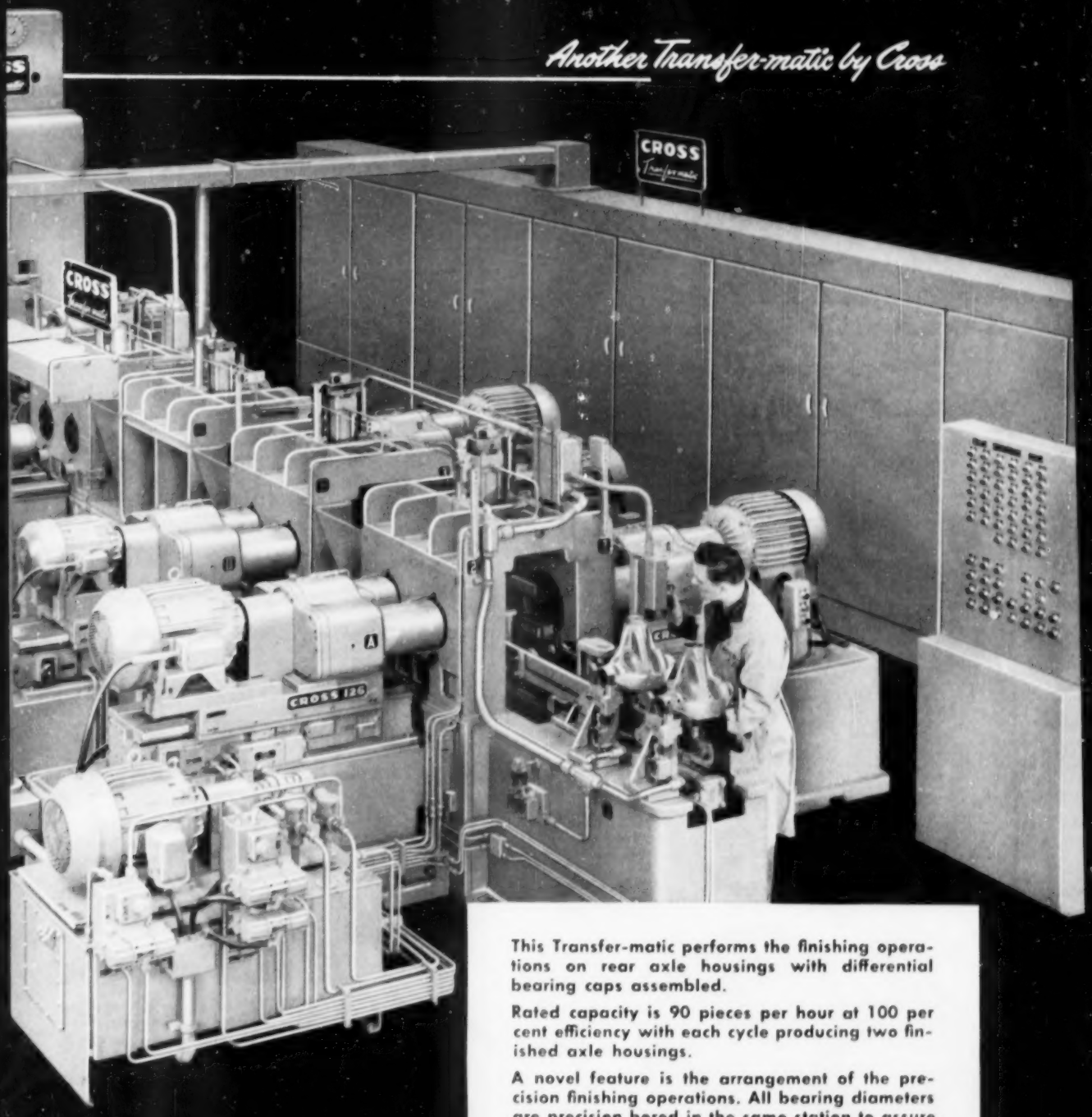
Station 3
Semi-Finish Bore
Tube Diameters

Station 2
Rough Bore
Tube Diameters



Station 1
Load Two Parts

Another Transfer-matic by Cross



This Transfer-matic performs the finishing operations on rear axle housings with differential bearing caps assembled.

Rated capacity is 90 pieces per hour at 100 per cent efficiency with each cycle producing two finished axle housings.

A novel feature is the arrangement of the precision finishing operations. All bearing diameters are precision bored in the same station to assure precise gear centers. The vertical boring unit finishes first one and then the other of the two pinion shaft bearing diameters. In the same station, opposed horizontal units back-bore the differential bearing diameters. Perfect concentricity and squareness of the shoulders are obtained between the two pinion bearing seats since both are bored with the same spindle.

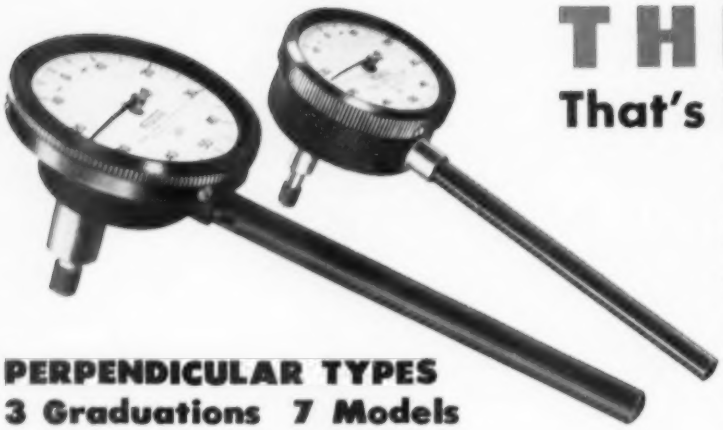
Other features are complete interchangeability of all standard and special parts for easy maintenance, construction to JIC standards, hardened and ground ways, hydraulic feed and rapid traverse and automatic lubrication.

Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN



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PERPENDICULAR TYPES
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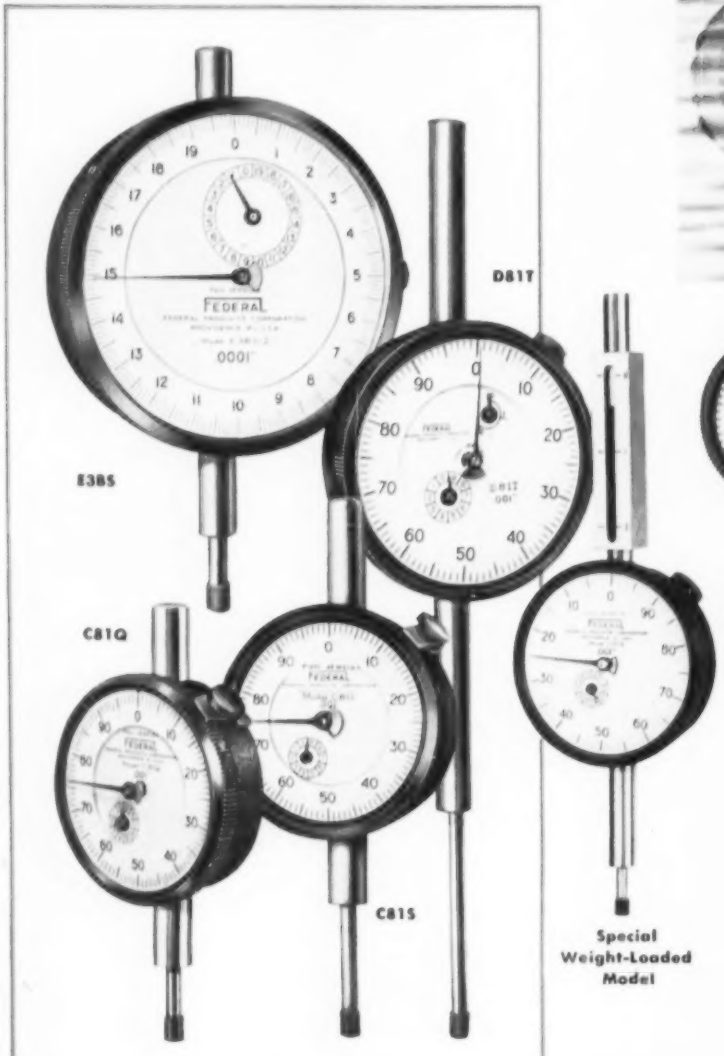
You get the benefits of doing business with a company which consistently offers improvements and new ideas.

You get a known accuracy and dependability built up over years of development and experience.

You save the confusion of stocking and maintaining several different makes of instruments.

LONG RANGE MODELS



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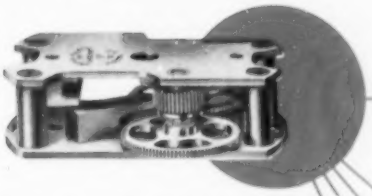
Standardize on—

FEDERAL

DIAL INDICATORS



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Assures Perfect Alignment
Positive Adjustment — Rigidity —
High Accuracy . . .

Maintenance men tell us repeatedly it is the easiest to repair.

NEW

FIVE SIZES
LOW FRICTION
ANY GRADUATION
PLAIN OR JEWELED

LONG LIFE
HEAVY DUTY

Another new in Federal Indicators (H Model). The best you can buy in every way. A really rugged, shock-proof, maintenance-free, lifetime Dial Indicator that withstands more impact. Low maintenance, greater accuracy. 16% to 25% less friction. Four sizes. Furnished in Regular, Wetproof and Long Range models.

Whatever you need in Dial Indicators and Accessories you can get from Federal (direct from our Branch Offices too.) And, you'll be in line for new developments later. If you haven't a catalog, tell us if you want one.

FEDERAL PRODUCTS CORPORATION
71912 EDDY STREET **PROVIDENCE 1, R. I.**

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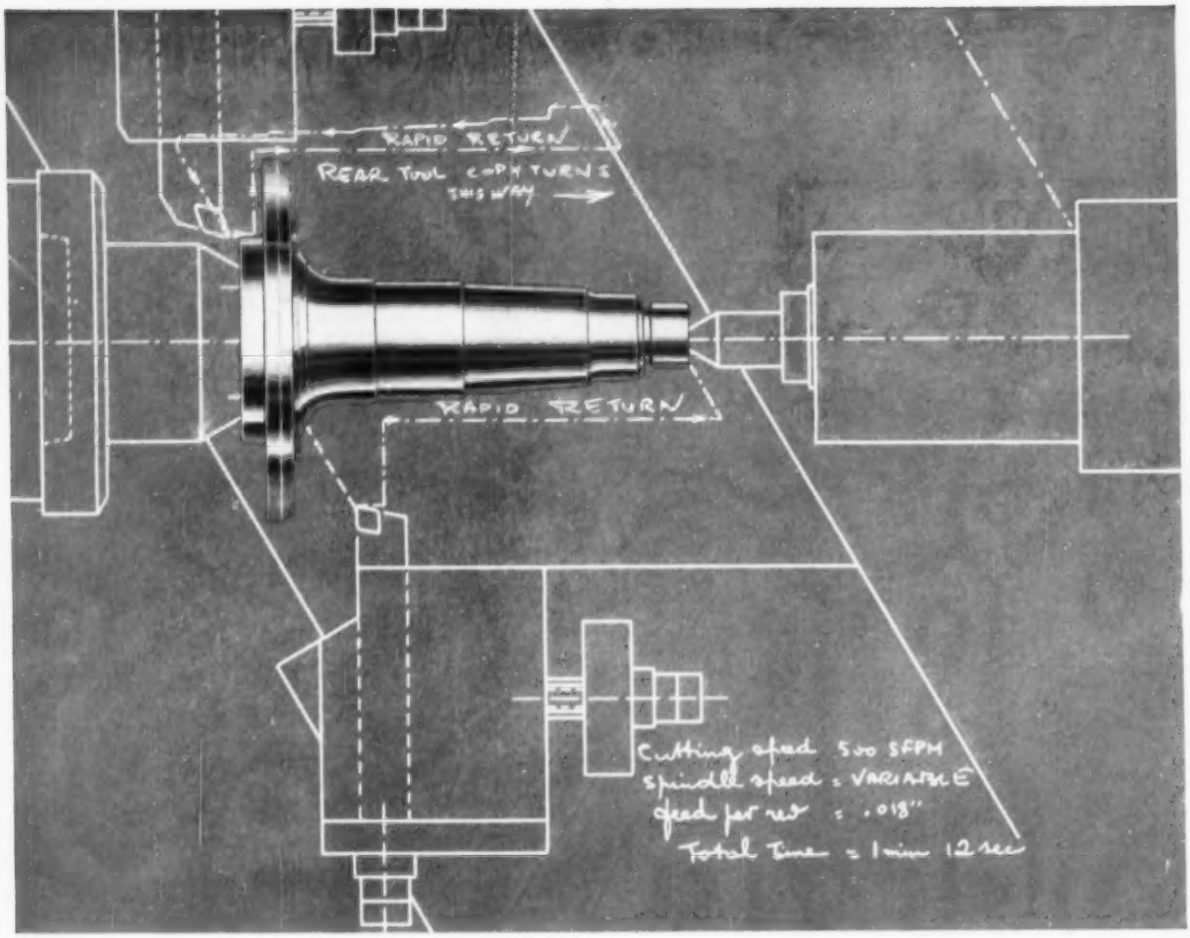
FOR RECOMMENDATIONS IN MODERN GAGES . . .
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

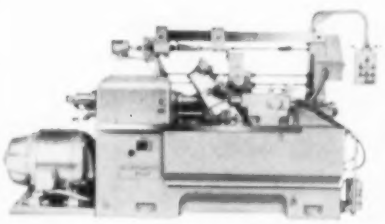

RAPID RETURN
REAR TOOL COPY TURNS THIS WAY
RAPID RETURN
Cutting speed 500 SFPM
spindle speed = VARIABLE
feed per rev = .018"
Total Time = 1 min 12 sec

Without special tooling the Conomatic Pilot can copyturn a 90° reverse shoulder like this

With the Conomatic Pilot copying lathe, you can copyturn a 90° reverse shoulder with a single cross slide. Although this hydraulically-controlled multicycling lathe can be equipped with as many as two infeed slides and two cross slides, its ability to copyturn in reverse often makes costly special tooling unnecessary.

For example, the 90° reverse shoulder on the automatic transmission part shown above is copyturned in reverse by the rear tool on the 60° cross slide when the lathe's motorized template indexes after the front tool has completed its pass. Total time is 1 minute 12 seconds, with a gross production of 50 pieces per hour.

Write us today for a brochure giving details and specifications of the Conomatic Pilot—the world's most versatile copying lathe.



The Conomatic Pilot Model KU: A hydraulically-controlled multicycling copying lathe with piloted hydraulic feed that provides constant feed per revolution. Motorized rotating template provides up to four passes and four rapid returns or four additional passes in reverse. Adapted to completely automated loading and unloading.

Conomatic

CONE AUTOMATIC MACHINE CO., INC., WINDSOR, VT.

PILOT DIVISION

30 Rockefeller Plaza, New York 20, N. Y.

specializing only in drill jig bushings

American SPECIALIZES — that's the reason you get BLUE CHIP service when it comes to drill jig bushings. For instance, American's exclusive distributors can immediately fill every A. S. A. requirement —and more than 50 per cent of what are usually considered "specials" right off the shelf. Specializing also means you buy the finest drill jig bushings when you buy AMERICAN!

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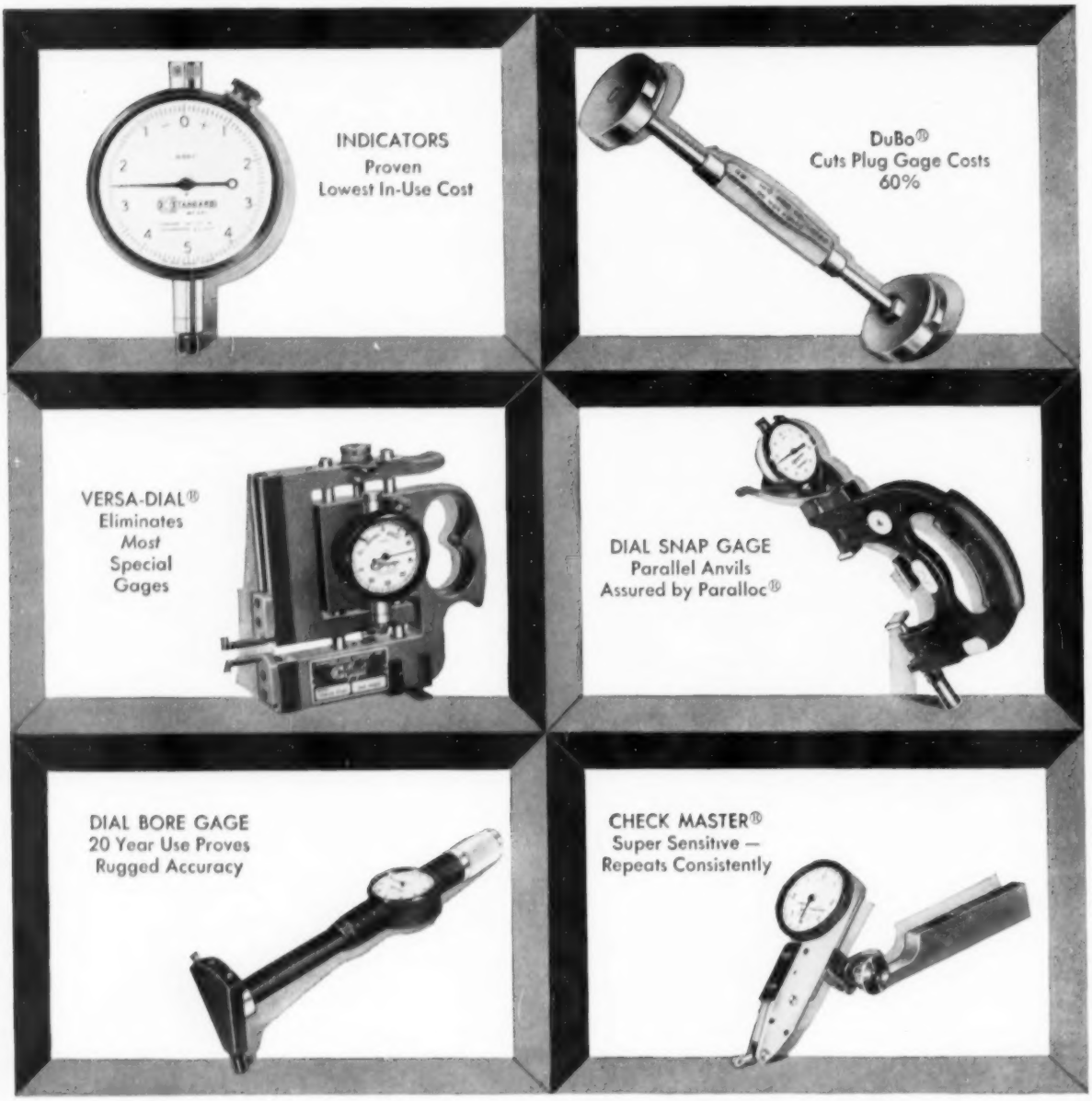

Look for the PLUS VALUES Behind *Every* Gage by STANDARD

Over and above the normal requirements of fine gages, STANDARD brings you *extra values* that mean lower in-use cost. Ask the *Man-from-Standard* to show you his new, do-it-yourself gage test kit.

STANDARD GAGE COMPANY, INC.
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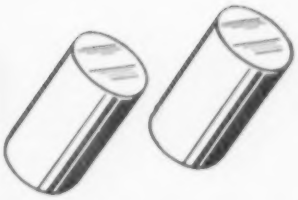
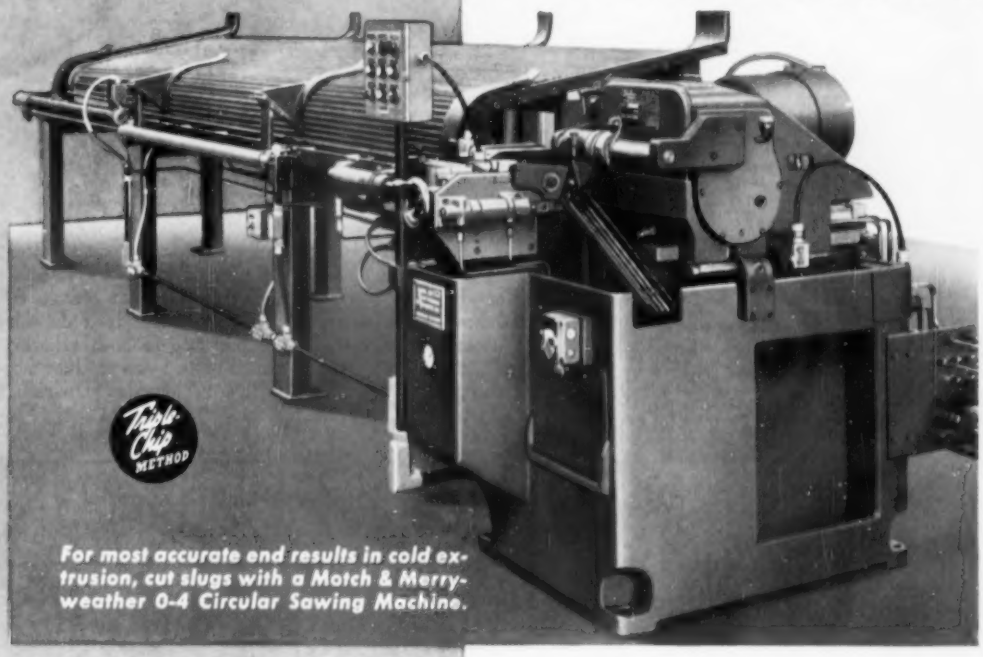
A COMPLETE LINE OF GAGES . . . INDICATING, FIXED AND ADJUSTABLE TYPES

cold cuts



BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

. . . make better COLD EXTRUDED PARTS

The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to ±.002" with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-Off, Milling and Special Machinery

7 great lapping machines for your profit-boosting

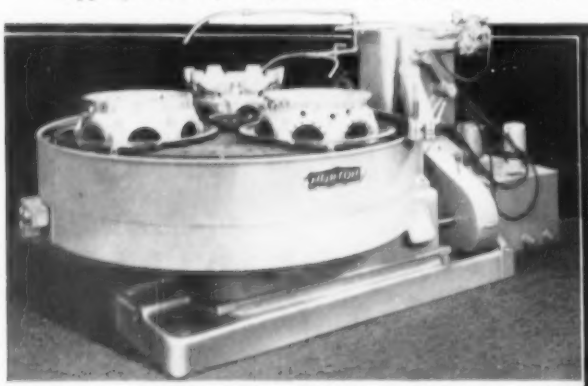
"TOUCH of GOLD"

If you are performing single or parallel face flat lapping operations you'll get real profit-boosting qualities from the ability of these machines to improve your product quality — shorten production time — lower your lapping costs. In other words — from their ability to give you the "Touch of Gold".

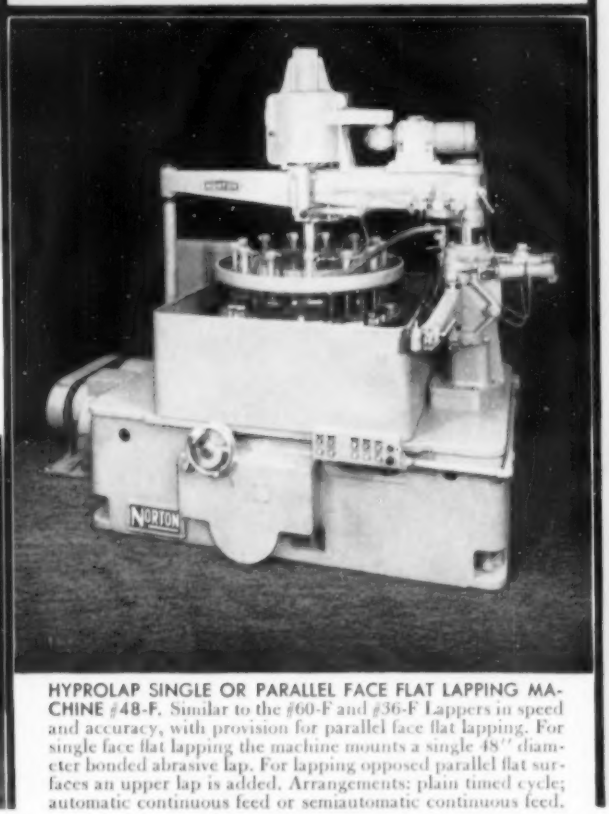
With NORTON HYPROLAP® machines you'll lap fast — and get clean work on which you can do further machining without cleaning operations — because their bonded abrasive laps leave your parts free of imbedded grit. The hydraulically operated truing devices on these machines provide additional advantages in assuring truth of lap face — plus the convenient means of quickly changing lapping action by rough or fine truing of the lap by simple adjustment of the speed of the truing arm.

For operations requiring cast iron laps, you will get continuing high investment return — and steady, low cost production from the #16-FC and #28 Lapping Machines — because of their simplicity of operation — and outstanding durability. They'll operate steadily for you with minimum attention or maintenance — hour after hour — day after day.

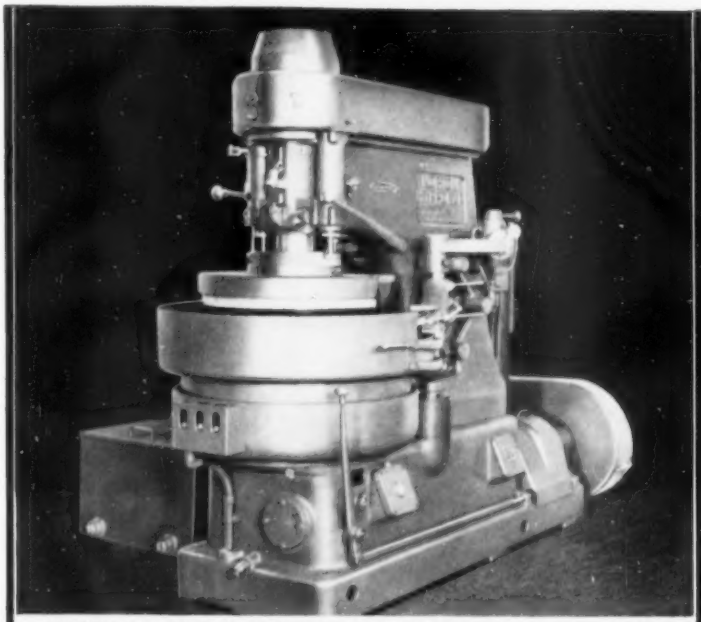
For further facts see your Norton representative or write direct. And remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



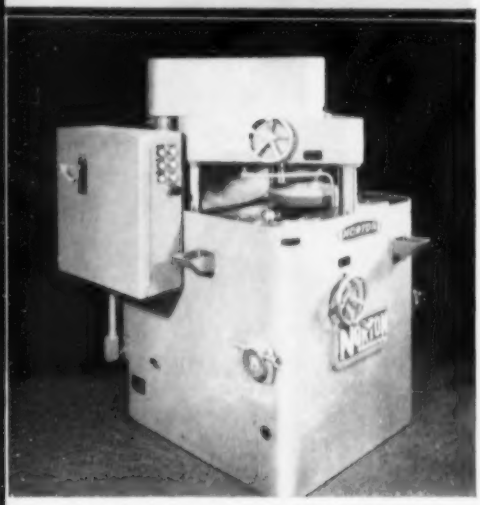
HYPROLAP SINGLE FACE FLAT LAPPING MACHINES #60-F (above) and #36-F (below). Sensational performers using bonded abrasive laps and filtered coolant. Provide clean seal surfaces, wear surfaces or reference surfaces for further machining. Available for small or large production lots: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Rigid power-operated truing arm insures true flatness of abrasive lap and finished work pieces. Heavy or light parts handled with equal ease.



HYPROLAP SINGLE OR PARALLEL FACE FLAT LAPPING MACHINE #48-F. Similar to the #60-F and #36-F Lappers in speed and accuracy, with provision for parallel face flat lapping. For single face flat lapping the machine mounts a single 48" diameter bonded abrasive lap. For lapping opposed parallel flat surfaces an upper lap is added. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed.



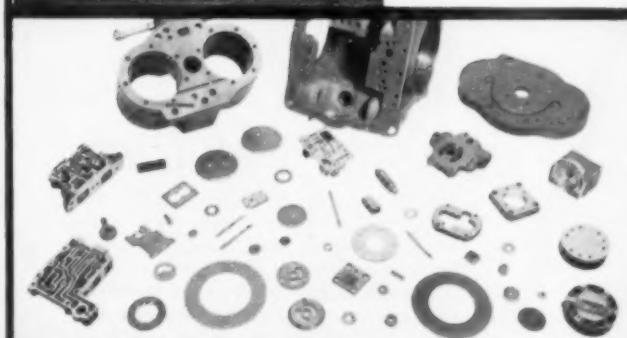
HYPROLAP LAPPING MACHINE #26. A high speed machine for two face flat lapping or cylindrical lapping that finishes up to 100 or more work pieces simultaneously. Lapping pressure is hydraulically powered and controlled — an exclusive Norton development. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. Like other HYPROLAPS, lap truing is hydraulically powered and controlled.



HYPROLAP LAPPING MACHINE #12-F. For small, parallel face flat lapping. Ideal for small ball bearings. Arrangements: plain timed cycle; automatic continuous feed or semiautomatic continuous feed. All three provide fast efficient lapping with selective speeds for laps and work-holders, permitting positive selection of ideal speeds for each job. Cleanliness of finished work surfaces eliminates the need for cleaning operations.

PLAIN TIMED CYCLE LAPPING MACHINE #28. Produces flat or cylindrical surfaces to extremely close tolerances and high degree of finish. Uses cast iron laps with loose abrasive. An attachment for cylindrical lapping is furnished with the regular flat lapping arrangement. For plug gage or gage block tolerances the machine is unsurpassed. An arrangement for hand lapping with 30", 36" or 40" cast iron laps is also available.

PLAIN TIMED CYCLE LAPPING MACHINE #16-FC. An outstanding performer for flat or cylindrical work, such as Diesel injector parts, plug gages, size blocks, sides of rings and short cylindrical parts. Using cast iron laps with loose abrasive it produces optically flat surfaces to extremely close thickness tolerances. Its fine repetitive accuracy helps reduce inspections and eliminates the need for selective assembly.



NORTON JOB LAPPING SERVICE. Improve your product quality by precision lapping. The Norton Job Lapping Department, complete and modern in every detail, is ready to finish jobs to your exact specifications. Flat or cylindrical lapping operations handled quickly to your tolerance specifications. Parallel face flat lapping is our specialty. See your Norton representative or write direct.

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NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
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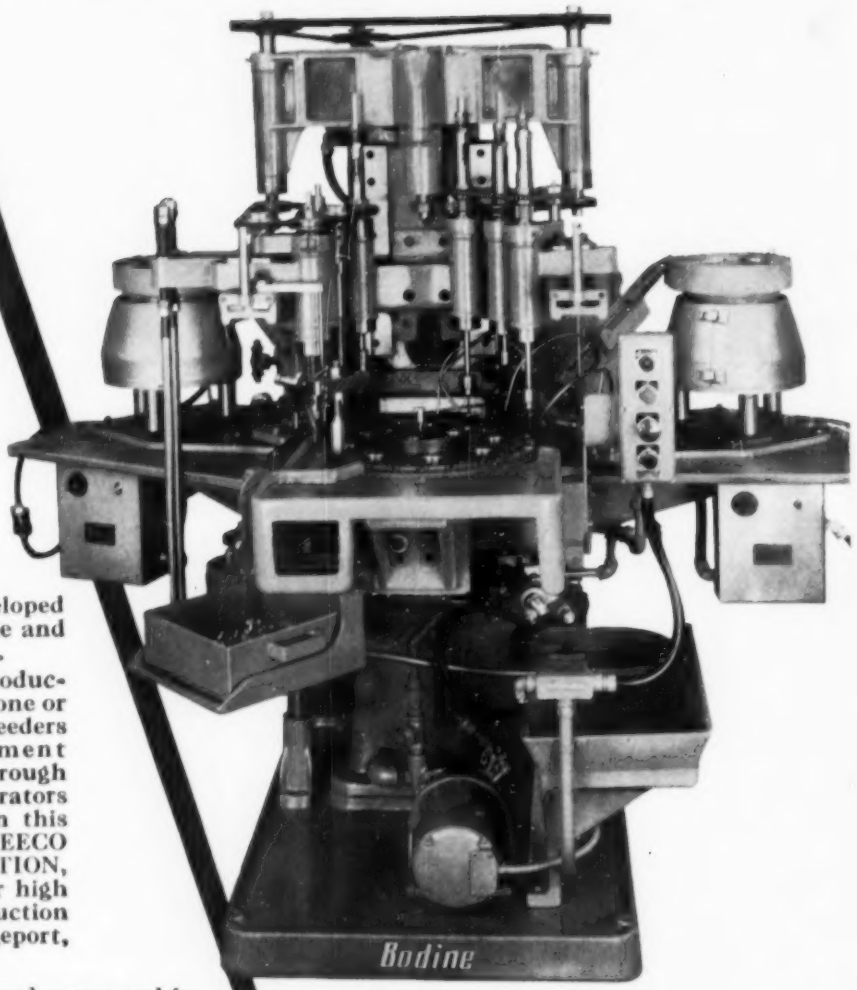
Production Equipment Produces

MORE with PEECO



Vibratory Parts Feeders play an ever increasing important roll in the industrial drama "to produce more for less." PEECO's leadership in the field of vibratory feeders and their helpfulness to industry in developed techniques that save time and money, are unchallenged.

Just as in the case of production lines, the placing of one or more PEECO developed feeders on production equipment effects great savings through the elimination of operators and/or operator time. In this field now being served by PEECO is the BODINE CORPORATION, the established name for high volume automatic production and assembly, of Bridgeport, Connecticut.

If you want to produce more, send for bulletin # 563 and ask for the name of the PEECO representative in your area.

DEVELOPED PEECO FEEDERS NOW included on production equipment by Bodine

This standard Bodine Model 4120, dial type, automatic tapping and screw inserting machine, automatically hopper feeds, transfers and drives two screws at a time and automatically captivates them. This machine normally operates to produce 2750 pieces per 50 minute hour.

THE WORLD'S LARGEST

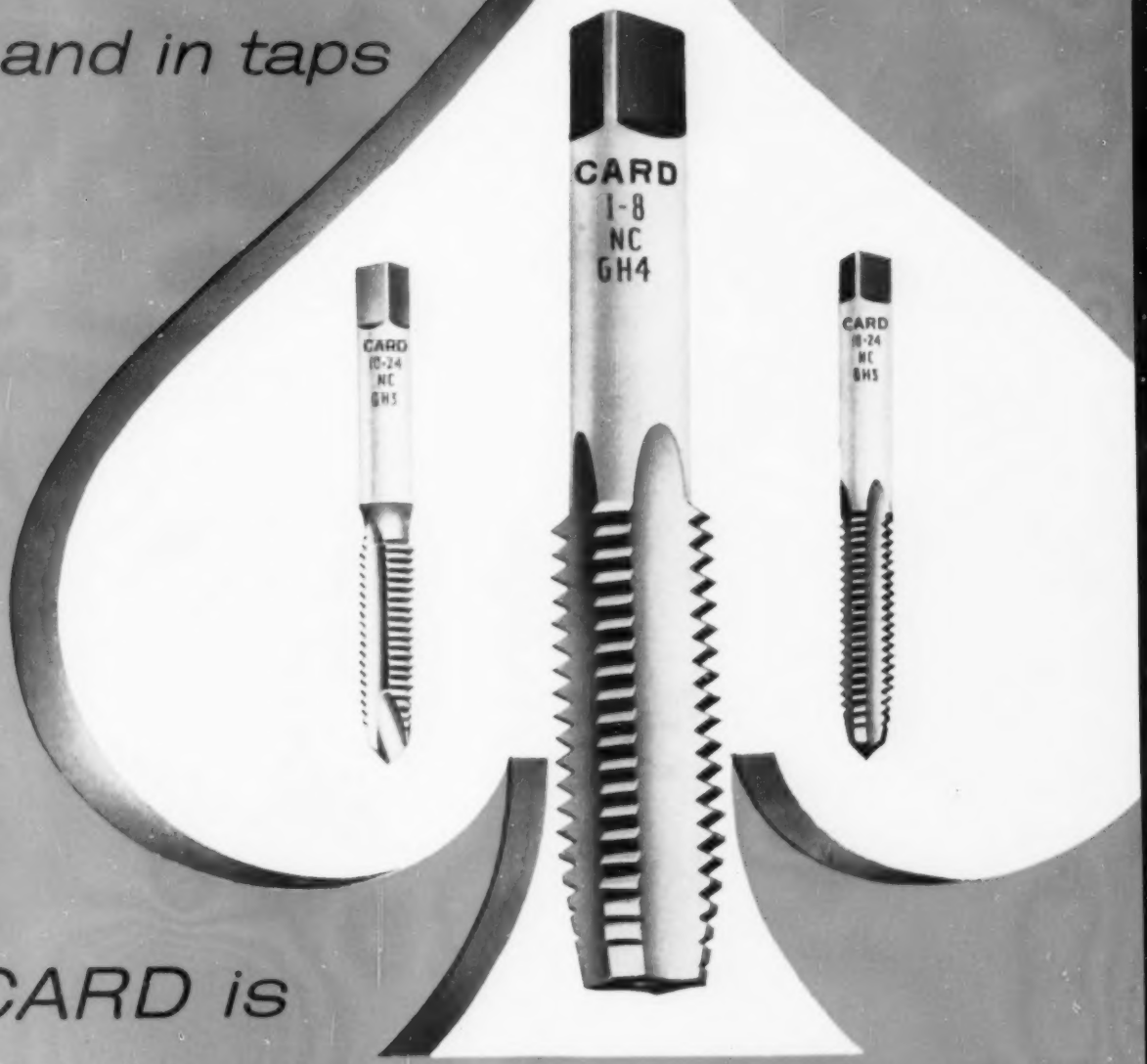
EXCLUSIVE MANUFACTURER

OF VIBRATORY PARTS FEEDERS

Peeco PERRY EQUIPMENT & ENGINEERING CO.

ERIE, PA. • • • DIVISION OF AUTOMATION DEVICES, INC.

...and in taps



CARD is

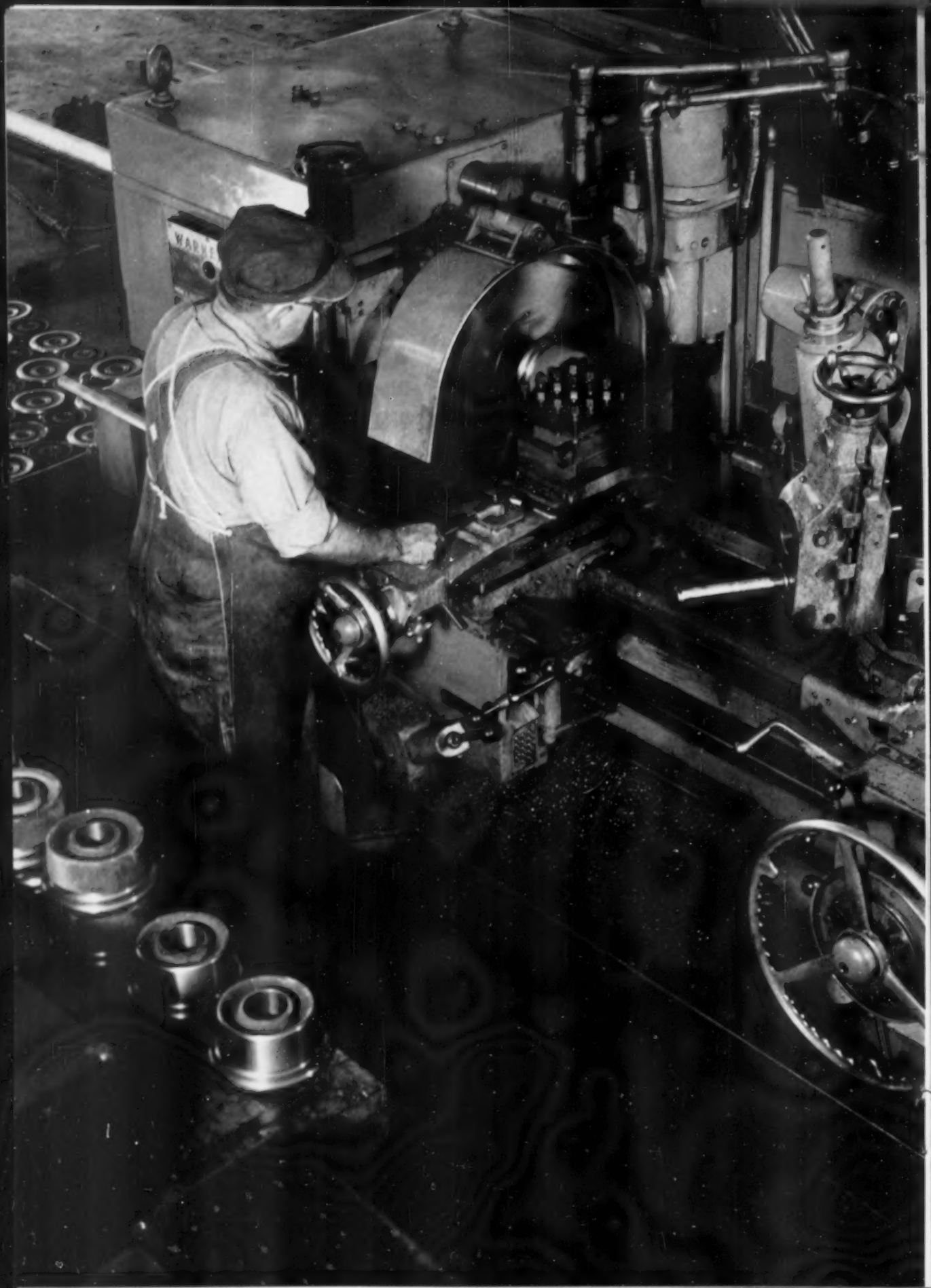
ACES with OPERATORS

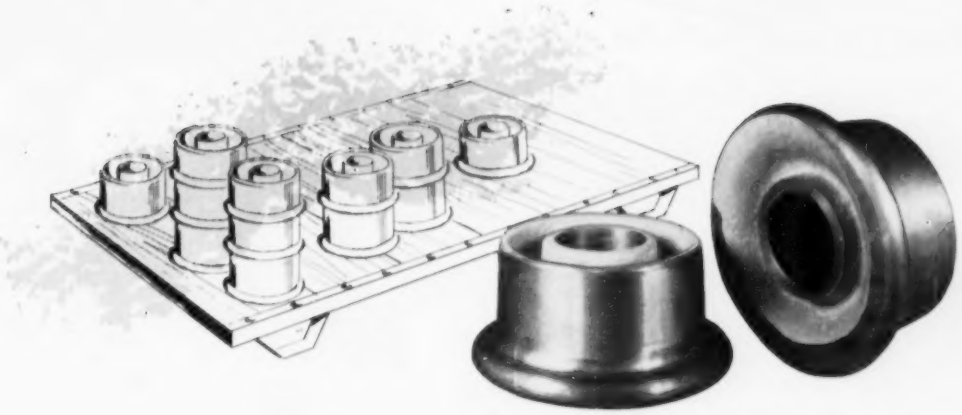
Operators busy at many different tapping applications will tell you that Card taps can be depended upon for precision performance and long life — on job after job. And shopmen are sure of getting uniform top quality in gages as well as taps, every time they use these popular Card tools. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through fine distributors from Coast to Coast





How Dempster Brothers solved the small-lot problem!

Dempster Brothers, Inc. of Knoxville, Tennessee—well-known makers of Dempster-Dumpster refuse-handling equipment—had a serious small-lot problem. Turning costs on their obsolete equipment were getting completely out of hand. Modernization was a must! But in order to profitably handle their wide variety of jobs ranging in lots from 5 to 200 pieces, they had to select the most versatile equipment possible.

Dempster found their answer in a new Warner & Swasey 3-A Saddle Type Turret Lathe, equipped with a 50 horsepower motor, cross slide taper and leading-on attachments and power chuck wrench. On the first job—a 200-piece lot of cast iron rollers (shown above)—production increased 3 to 1 over their old equipment.

Dempster particularly liked their 3-A's:

- **FLEXIBILITY AND EASE OF SETUP** which minimized inventory problems for both production and repair parts.
- **QUICK, SIMPLIFIED SPEED CHANGING** of the all-hydraulic headstock, giving optimum speeds for every cut.
- **RIGIDITY AND HIGHER SPEEDS** which permitted heavier roughing cuts and enabled close tolerances (plus or minus .001") to be held with fewer cuts.
- **POWER CHUCK WRENCH CONTROL** that substantially reduced part handling.
- **EASE OF OPERATION** that lessened operator fatigue and cut machine handling time.

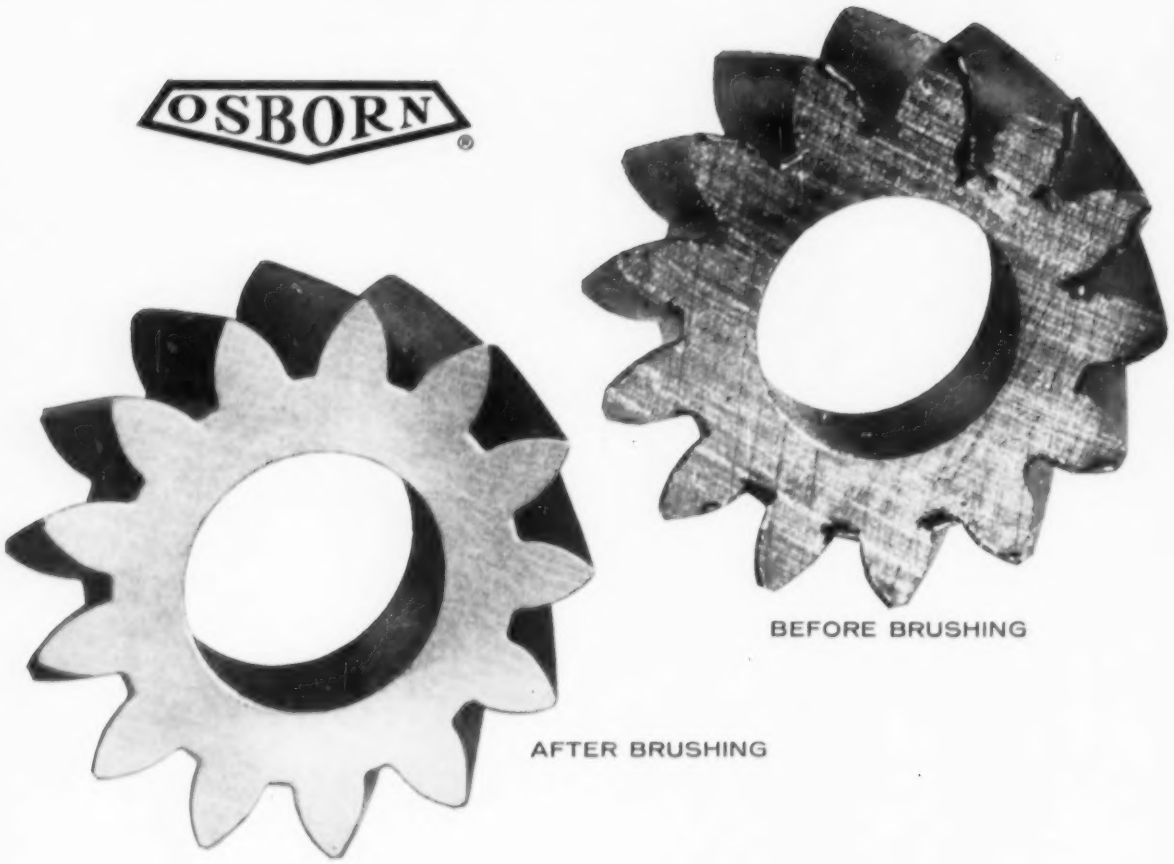
Call in your nearest Warner & Swasey Field Representative and let him show how these versatile machines, properly tooled, can handle your jobs more efficiently—boosting both production and overall profits.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS

...WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

OSBORN®



BEFORE BRUSHING

AFTER BRUSHING

How trouble-free transmissions get that way

. . . with OSBORN Brushamatic® Method

WHEN even the smallest chips or burrs get into an automatic transmission—there's trouble.

That's why leading automotive producers *depend* on Osborn Power Brushing to finish gears and other transmission parts.

At the same time, sharp corners and surface junctures are blended to reduce stress concentrations . . . the cause of many gear failures. Osborn Power Brushing does the job fast . . . efficiently at mass production rates.

This is the kind of job Osborn Power Brushing can do for *you*—no matter what you manufacture. An **O**sborn **B**rushing **A**nalysis, made in your plant at no obligation, will show you how. Write us. *The Osborn Manufacturing Company, Dept. K-41, Cleveland 14, Ohio.*

FAST, EFFICIENT REMOVAL OF BURRS *and blending of surface junctures on gears and hundreds of other metal parts is handled automatically on Osborn's Brushamatic® Machines.*

Osborn Brushes

Write for your copy of the 100-page Osborn Catalog 210-C and the 20-page Brushamatic® booklet.

BRUSHING MACHINES • BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

For fractional to 40 hp drives . . .

BOSTON Gear SPROCKETS and CHAIN

FROM STOCK . . . at Factory Prices

Catalog No. 56 lists
ANY TYPE OR SIZE YOU NEED

.81" to 38.20" P.D.
SPROCKETS, iron and steel, for single ROLLER CHAIN

1.92" to 26.74" P.D.
SPROCKETS, iron and steel, for double ROLLER CHAIN

¼" to 2½" P. ROLLER CHAIN
single, double, and triple

1.94" to 12.74" P.D.
SPROCKETS, iron and steel, for BLOCK CHAIN
⅛" to ½" w. BLOCK CHAIN

.37" to 6.07" P.D.
SPROCKETS, bronze and steel, for LADDER CHAIN
.185" to .353" P. LADDER CHAIN
brass and steel

Save machining time

SHOLD-A-GRIP
interchangeable tapered SPROCKETS and BUSHINGS
2.09" to 23.88" P.D. SPROCKETS adaptable with tapered BUSHINGS to shaft sizes ½" to 3" by 16ths

BORED-TO-SIZE
ready-to-install SPROCKET PINIONS
Complete with keyway and setscrew. ⅜" through 1" P., in 76 tooth sizes, with 321 stock bores

You get BOSTON GEAR top-rated quality and lasting economy. You save time and expense when you buy from local stock — *at factory prices.* Be cost-wise — standardize. Boston Gear Works, 83 Hayward St., Quincy 71, Mass.

CALL YOUR BOSTON Gear DISTRIBUTOR

For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

7124 "OFF-THE-SHELF" TRANSMISSION PRODUCTS **FROM STOCK** — AT FACTORY PRICES — ASK FOR CATALOG
Stock Gears • Sprockets and Chain • Speed Reducers • Bearings • Pillow Blocks • Couplings

GREENLEE TRANSFER MACHINES

Change with Your Requirements

THIS MACHINE HAS BEEN REWORKED FOUR TIMES

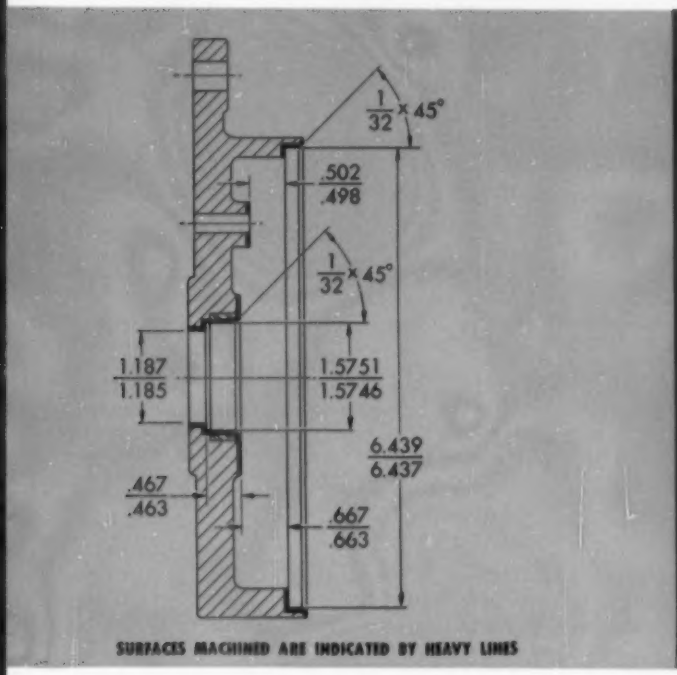
The "building block" idea of machine tool design has gained much popularity in recent years. Greenlee has long built such flexibility into their transfer machines. For example, the machine shown here has been modified 4 times in 11 years to accommodate changes in product design. Protect yourself from costly obsolescence. Ask Greenlee to show you how.

PHONE ROCKFORD, ILLINOIS 3-4881
TO HELP SOLVE YOUR PRODUCTION PROBLEMS

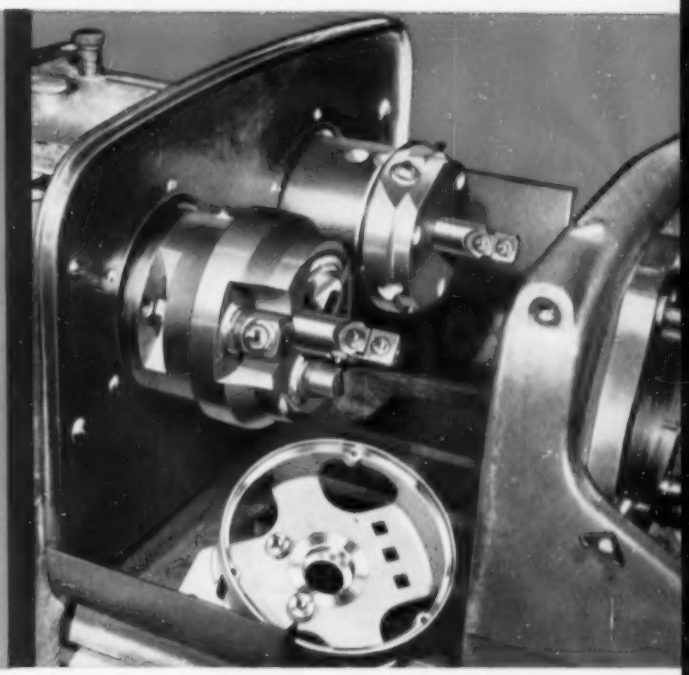
GREENLEE
BROS. & CO.

1992 MASON AVE.
ROCKFORD, ILLINOIS

9 surfaces rough and finish machined in 2 passes...



SURFACES MACHINED ARE INDICATED BY HEAVY LINES



HOW MICROBORE CLUSTER TOOLING DOES IT ON A PRECISION BORING MACHINE!

Special Microbore Cluster Tooling makes it possible for a leading electrical equipment manufacturer to obtain a continuous flow of finished parts by rough and finish machining, simultaneously, nine surfaces on a generator end bell casting in two passes.

SET-UP TIME IS FASTER, TOO—Independent, precision adjustment of each tool point permits accurate settings in a matter of seconds. Speed and accuracy of adjustment, plus compactness of Microbore units, makes cluster tooling practical to a degree formerly considered impossible.

Microbore is a versatile tool with unlimited application for all types of boring, turning and facing operations. Microbore Standard Boring Bars, Boring Bar Sets and Flash-Change tooling complete the perfect combination for accurate, quick change tooling.

To find out how Microbore can help you, write for our new catalog No. 58.

DeVlieg Microbore System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

How automobile engines were

HARPER'S WEEKLY

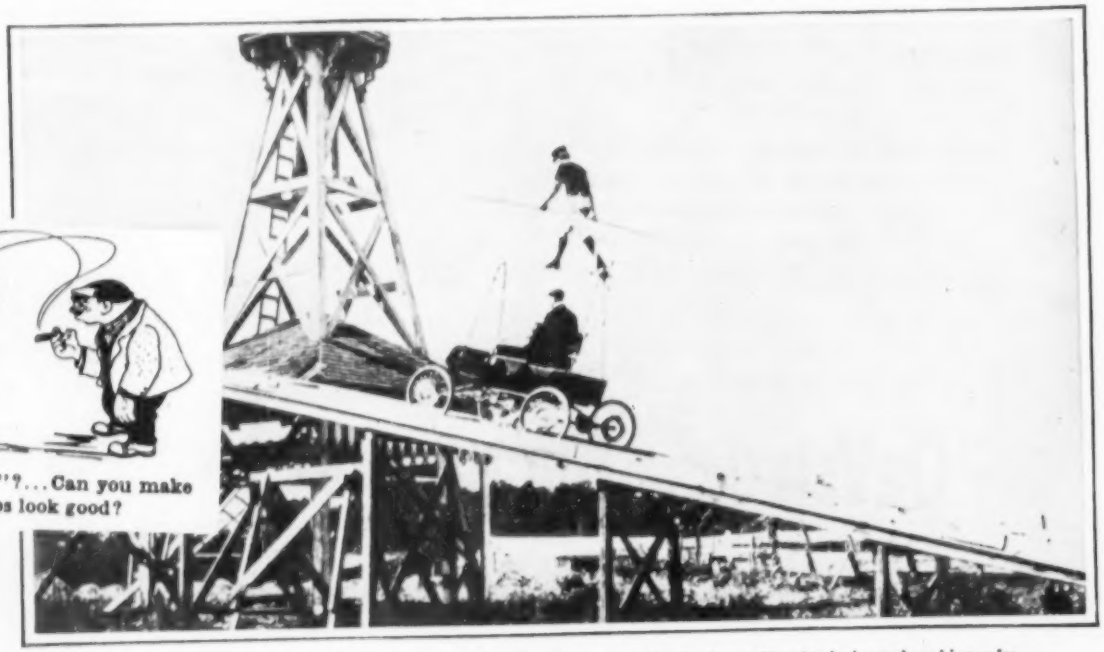
The page reproduced at left is from an August, 1903, issue of HARPER'S WEEKLY. It describes one of the first known attempts to measure vibration in automobile engines.

A Wire-rope Performer testing the Amount of Vibration of an Auto in Motion

A New Plan for Testing Autos

CONNECTED with an automobile factory in Michigan there is a very novel testing-ground for automobiles. It includes a speeding-track which is perfectly level, and which is macadamized to give a smooth surface. In addition, an incline has been constructed which has a grade considerably steeper than the average hill encountered on the highway. Not only is the full power of the auto tested on the track, but its climbing capacity as well. One of the principal faults liable in a motor vehicle is the vibration caused by the irregularity of the engine when in motion. The absence of this vibration is essential to the comfort of the occupant. On this proving-ground experiments are made to determine the extent of vibration, as shown in the photographs. They assume the form of tight-rope performances. An "aerial artist" balances himself upon a bar supported by a framework which is attached to the body of the ordinary runabout. The runabout is operated at various rates of speed, both on the level track and on the incline. The amount of vibration of the engines is decided largely by the ability of the wire-walker to keep his balance while the auto is in motion. The feat of balancing on a wire while the auto is going up grade, however, calls for considerably more skill. When the trial is successful, it is due to the uniform movement of the engine.

An "aerial artist"?... Can you make our engines look good?



The Test on an Incline—if the Rope-walker can keep his Balance, the Engine is considered to be in good working order

balanced in 1903 B.D. *(Before DYNETRICS)*

THIS BLAST FROM THE PAST... shows why it pays to keep up with the times!

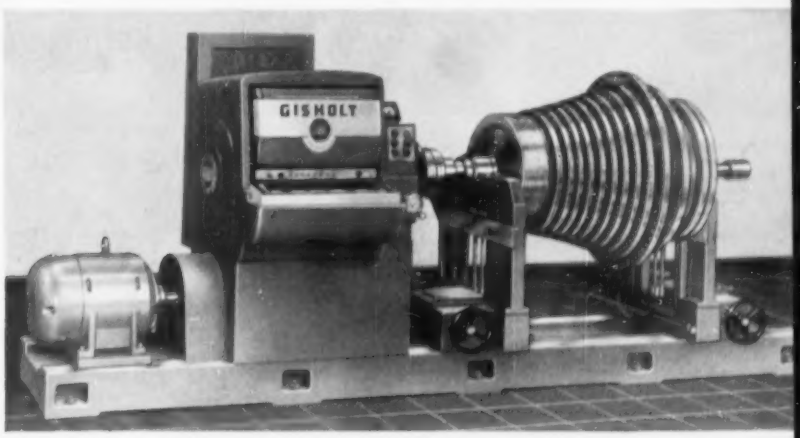
A lot of water has run under the bridge since 1903! During that same year the first transcontinental "auto" trip was completed at New York; the Wright Brothers were making their first successful flights at Kitty Hawk.

We've come a long way together in achieving today's high standards of manufacture and product performance. Gisholt worked with every industry, developed the equipment for balancing rotating parts weighing from a fraction of an ounce to many tons—for balancing parts a few at a time or by the thousands on a high-production basis.

How balancing is performed in 1957 A.D.
(After DYNETRICS)

Gisholt DYNETRIC Balancers use electrical networks to provide the necessary amplification for precise readings, eliminate guesswork by separating and isolating unbalance effects, for maximum accuracy and ease of correction on all types of work. No charts or graphs are needed; the amount of correction is indicated in units most practical for the work. Whether you balance parts from a fraction of an ounce to 150 tons, there's a Gisholt Balancer to give you the highest known standards at the lowest possible cost.

Gisholt 1S Balancer for parts up to 12" diam. weighing 1 to 30 lbs.



Gisholt 6U Balancer for parts up to 68" diam. weighing 500 to 10,000 lbs.

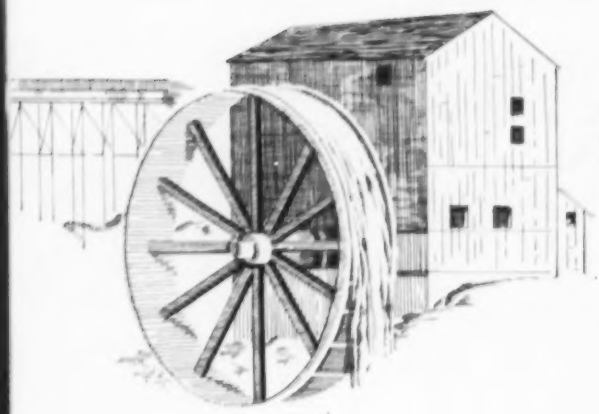
IS YOUR BALANCING UP TO DATE?

The way to be sure that you are not missing out on developments that can save you time and money—and improve your product—is to write for Gisholt's General Balancing Catalog Form 1109BD.

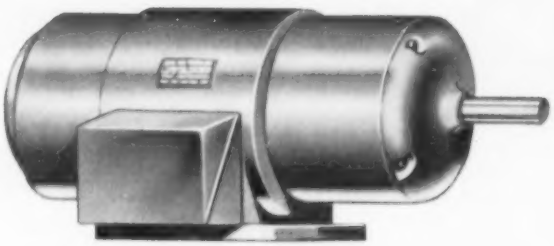
DYNETRIC BALANCERS GISHOLT

GISHOLT MACHINE COMPANY

MADISON 10, WISCONSIN, U.S.A.



Great in its day...



BUT

WOULDN'T YOU

RATHER HAVE THE LATEST TECHNICAL ADVANCE?

Now . . . from Heller

Another great technical advance in tools...

"Job Tempered" Metal Cutting Band Saws

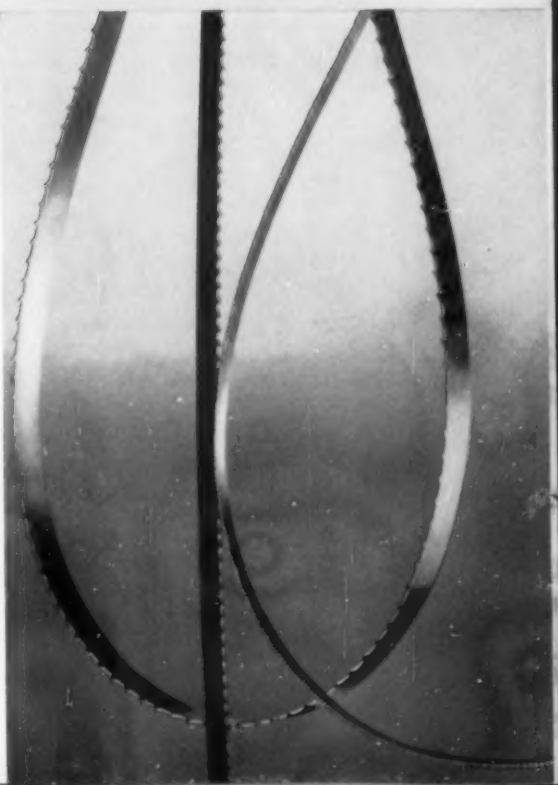
Certified by American Standards Testing Bureau to meet their standards for superior cutting — Uniform Teeth . . . Uniform Set . . . Uniform Temper*

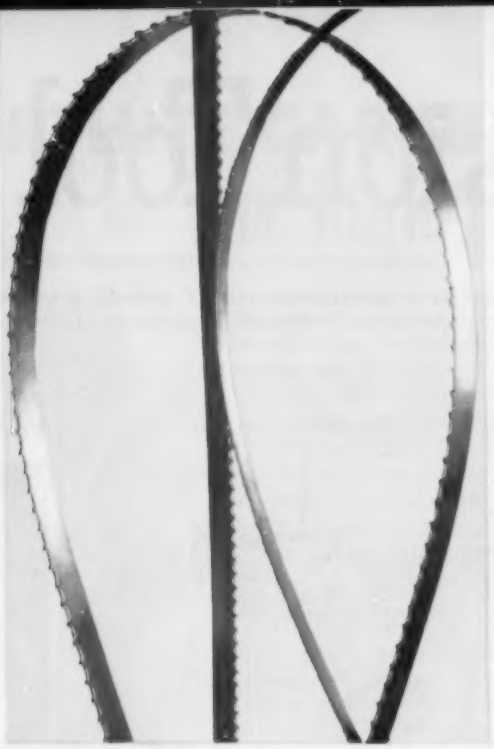
There's a new way to achieve smoother, faster cutting on band saw machines, with longer life on a variety of metals. Heller's "JOB TEMPERED" Metal Cutting Band Saws.

Heller's exclusive metallurgical and heat treating processes that have won these blades the name "JOB TEMPERED" have also earned them American Standards Testing Bureau's Certification. This is your assurance that these blades meet the three prescribed standards for superior cutting . . . uniform teeth . . . uniform set . . . uniform temper. As a result, when you use the *right* Heller Blade for the job, you're sure of superior cutting every time.

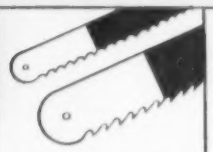
Heller "JOB TEMPERED" Hard Edge Band Saw Blades are available in all tooth shapes . . . Standard Tooth (Regular or Wavy Set), Skip Tooth and Hook Tooth. Saws are available in all standard widths and tooth spacings . . . in 100′ and 250′ coils or welded to specified lengths for use on all type machines.

High Speed Steel Band Saws are also furnished for specific applications.

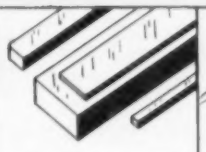




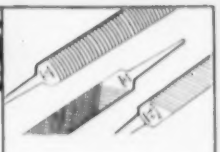
Heller nucut



HACK SAW BLADES



FLAT GROUND DIE STEEL



FAMOUS HELLER FILES

HELLER TOOL CO. Newcomerstown, Ohio

America's oldest file manufacturer

A subsidiary of Simonds Saw and Steel Co.

Give us your toughest band sawing problems

If you've been having trouble, let us show you how the *right* JOB TEMPERED metal cutting band saw can give you better cutting, longer service and greater economy.

Here are the facts!

Heller's new catalog of JOB TEMPERED metal cutting band saws contains full description of types of blades, tooth designs and set. WRITE FOR YOUR COPY TODAY.

SOLD EXCLUSIVELY THROUGH

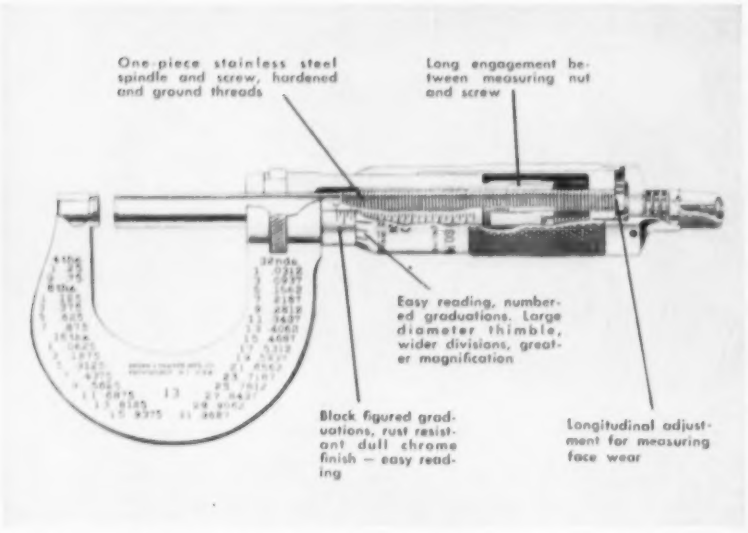
Heller Distributors

"YOUR OUTSIDE TOOL ROOM"

Heller the Toolers Tools

Precision Tool News

No. 3 B·S REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER


One-piece stainless steel spindle and screw, hardened and ground threads
Long engagement between measuring nut and screw
Easy reading, numbered graduations. Large diameter thimble, wider divisions, greater magnification
Block figured graduations, rust resistant dull chrome finish — easy reading
Longitudinal adjustment for measuring face wear

Brown & Sharpe Micrometers Lead Field In Features to Insure Lasting Accuracy

Accuracy alone is but half the test of precision tool value. What makes a tool useful is accuracy that *lasts* . . . month-after-month performance without error or extra-special handling. Where wear is inevitable, adjustments must be easy and complete.

Careful comparisons with other American micrometers will show you that Brown & Sharpe micrometers have many exclusive features that do insure *lasting accuracy*. For example: *Only* B & S micrometers give you the advantage of a one-piece stainless steel spindle and screw. *Only* B & S micrometers have a *long* bearing surface between measuring nut and screw, to minimize wear. *Only* B & S micrometers protect you from costly "25-thousandths" errors by means of an easy longitudinal adjustment. It enables you to reset the thimble quickly whenever it is necessary to resurface the measuring faces.

Clean-cut numbers and graduations, wider divisions on large diameter thimbles, make Brown & Sharpe micrometers easier to read, too.

B & S Intrimik Brings Micrometer Caliper Ease To Inside Measurements

Intrimik ("in-tri-mike") is an internal, tri-point micrometer that measures the I.D. of any hole within its range *directly* . . . as easily and accurately as a micrometer caliper takes outside measurements. While other tools for inside measurements lack either range or self-positioning features, Intrimik combines both, and takes measurements in deep holes as well.

B & S Distributors Play Key Role In Providing Complete Service

Hundreds of distributor salesmen from all parts of the country have attended courses at Precision Center in the first 9 months of 1957 . . . in order to bring you completely up-to-date knowledge about B & S Industrial Products.

Precision tools and other items in the broad Brown & Sharpe Industrial Products line are available to you immediately from stocks carried by your local B & S distributor.

To assist you he has factory-trained men who are thoroughly familiar with the Brown & Sharpe line. Their knowledge is kept up-to-date by attendance at regular classes for distributors' salesmen held at Brown & Sharpe's Precision Center in Providence.

In this way, your B & S distributor provides a complete tooling service only minutes away from your plant in any industrial area. Call him about all of your precision tool needs; for experienced, on-the-spot cooperation. Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

WATCH WHAT'S HAPPENING AT

Brown & Sharpe B·S

PRECISION TOOLS AND GAGES • MILLING, GRINDING AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • GEAR, VANE AND CENTRIFUGAL PUMPS

3 New FIRTHITE CARBIDE Grades for high production !

NHA

Because of the many new materials and tougher, harder-to-machine non-ferrous alloys and the use of more powerful machine tools, there is an increasing demand for better grades of carbide for economical, high production machining of cast iron, stainless steels, aluminum, brass, copper, etc.

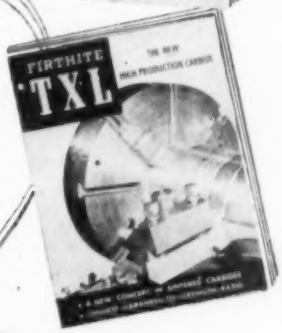
Now, grade NHA, Firth Sterling's newest concept, combines the hardness of precision finishing grades and the toughness of general purpose grades to machine these tougher alloys.

TXH

TXH, designed as a heavy duty, general purpose, steel cutting grade, is composed of the exact amounts of alloys necessary to produce the ideal *combination* of hardness, strength, and impact resistance to give maximum performance and tool life as a steel cutting carbide for:

1. High Production, heavy duty, turning, facing and boring on all types of steel.
2. General Purpose, job shop type of work with wide range of use from heavy duty to light cuts with relatively slow to high speeds.

TXL



Grade TXL was designed specifically for the machining of steel from finishing cuts to the medium roughing range of operations.

Grade TXL has the highest hardness-to-strength ratio thus far achieved in a cutting grade for the intended range of operations on steel. Because of its unique combination of properties and composition, Grade TXL gives more crater and edge wear resistance than is obtainable in conventional grades in this class.

Mr. Tooley says: Clip and mail coupon today! Don't delay!

Firth Sterling Inc
200 Firth Sterling Building
3113 Forbes Street, Pittsburgh 30, Pa.

Please send the following technical bulletins, as checked, without obligation.

☐ NHA	☐ TXH	☐ TXL
Bulletin SL 2101	Bulletin SL 2096	Bulletin SL 2079

Name _____

Company _____

Address _____

A-328

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

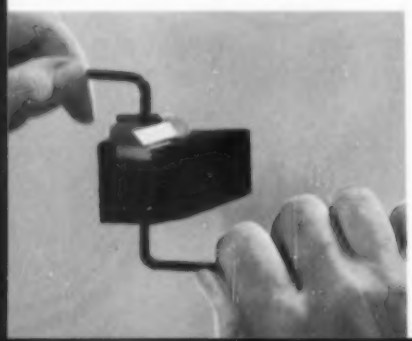
MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON, WEST HARTFORD, YONKERS
OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND* DAYTON DETROIT* WEST HARTFORD* HOUSTON* LOS ANGELES* PITTSBURGH WESTFIELD, N.J.

PRODUCTS OF FIRTH STERLING METALLURGY

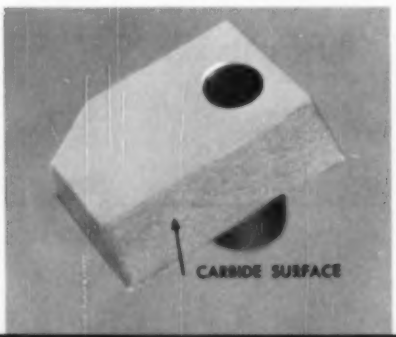
High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

1 New! Self-loosening chipbreaker clamp. A twist of the wrist releases insert for indexing . . . automatically lifts and lowers chipbreaker. No more prying chipbreaker free. No more fumbling with loose chipbreaker. Choice of 3 chipbreaker widths for accurate chip control.

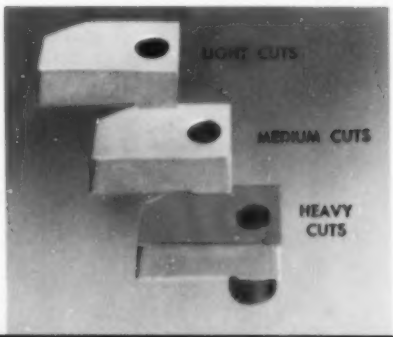
2 New! Setscrew accessible from top or bottom! Screw easily reached when holder is upside down or on its side. Easier indexing from any position.



3 New! Unique carbide-surfaced chipbreaker. New method bonds carbide coating directly to chipbreaker. Ends all possibility of braze failure.



4 New! Three color-coded chipbreakers. Choice of three widths: yellow for light cuts, silver for medium cuts, red for heavy cuts. Makes identification easy.



ANNOUNCING THE ALL-NEW CARBOLOY® LIFT-O-MATIC TOOLHOLDER

Only toolholder on the market with these 6 advanced design features

Indexes faster, easier – from any position. Setscrew on Carboloy Lift-O-Matic Toolholder can be turned from either top or bottom. Even if the holder is upside down, or on its side, the setscrew is always easily accessible.

What's more, the clamp and chipbreaker are in one piece – and rise automatically when the setscrew is loosened. There's no time wasted in fumbling with the chipbreaker or prying it free.

Reduces set-up time, speeds up production. Because Carboloy Lift-O-Matic Toolholders can be set up faster and indexed right in the machine, downtime is reduced – you get more production.

Because of the new holder design and harder steel shanks, you get closer tolerance production . . . less scrap loss.

17 styles in 8 sizes – stocked for immediate delivery. Lift-O-Matic Toolholders are now at your local Authorized Carboloy Distributor. Call today; his name is in the Yellow Pages. Or, for new Lift-O-Matic Toolholder Catalog, write: *Metallurgical Products Department of General Electric Company, 11173 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

5 New! Fewer parts to replace or stock. Holders use fewer parts. And all are standardized to cover widest range of applications. Means reduced inventories.

6 Insert clears top of the shank. Stops chipping of fresh cutting edges against walls of insert pocket. Inserts are positively clamped; clamp never touches shank.

NEW! TRANSPARENT PACKAGES FOR CARBOLOY INSERTS

New plastic package makes it easy to see what's inside...easy to pick out insert.

Left to right: light-duty angle screw driver; light-duty angle nut setter; heavy-duty angle screw driver; heavy-duty angle nut setter.

NEW "ANGLES"

for close-quarter screw driving and nut setting

A new line of angle attachments—that take over where straight line tools must leave off—is now available for the new line of improved Keller Tool air drivers.

Four new attachments—heavy- or light-duty angle screw drivers and nut setters—speed and simplify the *tough* job of driving fasteners in close quarters and hard-to-reach places.

Keller Tool No. 2 air motors—*with increased speed, increased power, low noise level and low maintenance*—power both the 12G-2 series screw drivers and the 16G-2 series nut setters.

Ask your Gardner-Denver representative for a demonstration of the new Keller Tool No. 2 air drivers and their versatile attachments . . . or write for details.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-12-38

These are the POINTS to remember

1. A Complete Family of rotary cutting tools from one reliable source.

2. Lower Tool Costs and Higher Production when you use "Standard" quality tools.

3. Engineering Service is available to you at all times to help you get the most from your "Standard" tools.

YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

Quality Tools Since 1881

STANDARD TOOL CO.

3950 CHESTER AVENUE — CLEVELAND 14, OHIO

STANDARD TOOL CO.

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide Tools · Gages*

Roughing and Finishing—*"More Use per Dollar"*

MANHATTAN CENTERLESS WHEELS

The same Manhattan Centerless Wheel used for roughing can be used for finishing — simply by controlling the feed rate and the amount of stock removed! To do *both* jobs efficiently — at top grinding speeds — Manhattan Centerless Wheels are specially bonded. They have a higher grit-carrying rubber bond that insures maximum metal removal with *every* pass . . . permits *fewer* passes to obtain stock removal to required tolerances and desired finishes — even with coarse grained abrasives! The greater strength built into these wheels also permits higher speed grinding — up to 8500 sfpm! You get more production at lower cost . . . "More Use per Dollar" with Manhattan Rubber Bond Centerless Wheels and Regulating Wheels.

Manhattan Centerless Wheels and Regulating Wheels are custom-made for your specific job requirements. Regulating Wheels are supplied either plain or core-mounted. Manhattan Core Mountings also result in substantial savings. Let a Manhattan representative show you how Manhattan Centerless Wheels and other high speed, heavy duty abrasive wheels do a *better* job, *longer* . . . give you "More Use per Dollar."

RM743

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

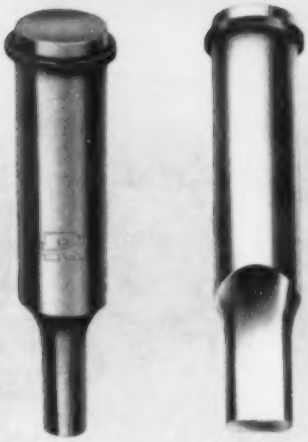
Here's why...

Ring Punch & Die, Inc. JAMESTOWN, NEW YORK

uses Latrobe's

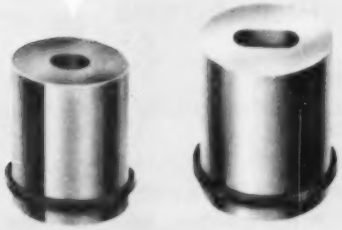
FREE MACHINING HIGH CARBON— HIGH CHROMIUM TOOL STEELS

for Standardized Precision Punches and Dies



TOOL LIFE INCREASED!

Screw machine operation increased from 45 pieces to 80 pieces per hour when machining Latrobe's GSN FM tool steel. In production, the cut-off and form tool life increased over 100% between grinds!



PRODUCTION DOUBLED!

Round hole dies are drilled and taper reamed. Oblong hole dies are milled and counterbored. Again, Latrobe's GSN FM tool steel resulted in savings—production per hour was doubled; cost of drills, end mills and reamers reduced!

EXCEPTIONAL WEAR IN USE!

Exhaustive field tests, conducted by Ring Punch and Die, Inc., have showed that GSN FM punches and dies give exceptional wear in actual production use. No loss of punch life, or chipping, was detected over that normally experienced when punches and dies were made of regular high carbon-high chromium steel without the "free machining" sulphide additives.

GSN FM is an oil hardening high carbon-high chromium steel possessing outstanding non-deforming characteristics in heat treatment. It contains sulphide additives that greatly improve its machinability. These alloy sulphides, as well as the important carbide particles, are evenly dispersed throughout GSN FM by Latrobe's exclusive DESEGATIZED® process of manufacture—your assurance of uniform tool steel quality.

Call your nearest Latrobe representative for complete data on GSN FM and other quality tool steels. A wide range of sizes for immediate delivery stocked at conveniently located warehouses.

Latrobe

STEEL COMPANY

Main Office and Plant: Latrobe, Pa.

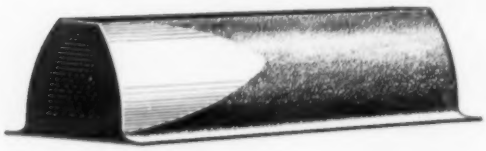
Branch Offices and Warehouses Located in Principal Cities

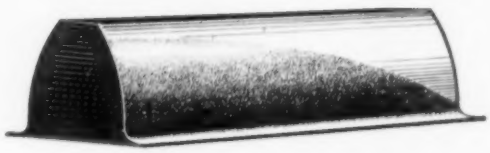
Hard Gear Honing

GIVES YOU BETTER GEARS AT LESS COST

QUICK GEAR INSPECTION

One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.





CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.

IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY

7875

"These 'super-speed' inclinables give me twice the production . . . at about half the cost!"

From their special vibration-absorbing legs to their counterbalanced shafts, these presses are built for speed.

With such special features as bronze gibs . . . automatic lube systems . . . special clutches, brakes and flywheels, and equipped with precision feeds, they can knock out short stroke work at better than 500 strokes a minute! They're all new, all Bliss, and the cost is low—surprisingly so.

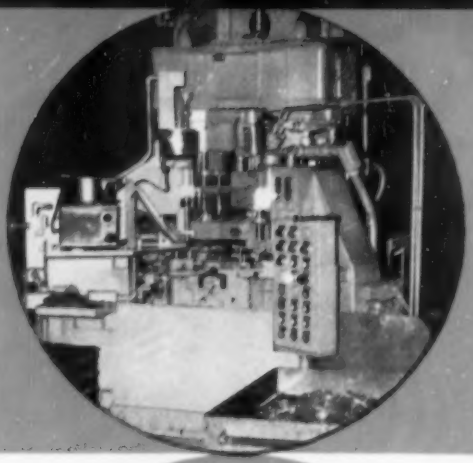
These are the latest members of Bliss' line—the line that offers industry its most complete choice of types and sizes. And with no axe to grind for any one type, you can be sure of impartial pressroom counsel—by Bliss.

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.



Two sizes of motor end-plates are assembled, bored, drilled and tapped in a Natco 3-Way Machine.

At Wagner Electric Corporation

One Natco

NATCO

Assembles, Bores, Drills and Taps... Reduces Labor Cost 70% On Small Motor End-Plates

This Natco combination assembly and multi-drilling machine presses a bearing sleeve into the end-plate, rough and finish bores the outside bearing-cap hole, drills an oiler hole at an angle, drills four (4) thru-bolt holes, and drills and taps two (2) 8x32 cover plate holes. *Production is 170 pieces per hour.*

This Natco accommodates two sizes of motor end-plates without changes in the basic rotary-table tooling. In addition to this important versatility the engineers at Wagner Electric point out these other advantages:

- *one operator* controls the assembly and machining from one station.
- *work scheduling* is simplified due to the short machine cycle.
- *in-process inventory* can be kept at a minimum because of high production rate.
- *floor space* is made available for other operations.

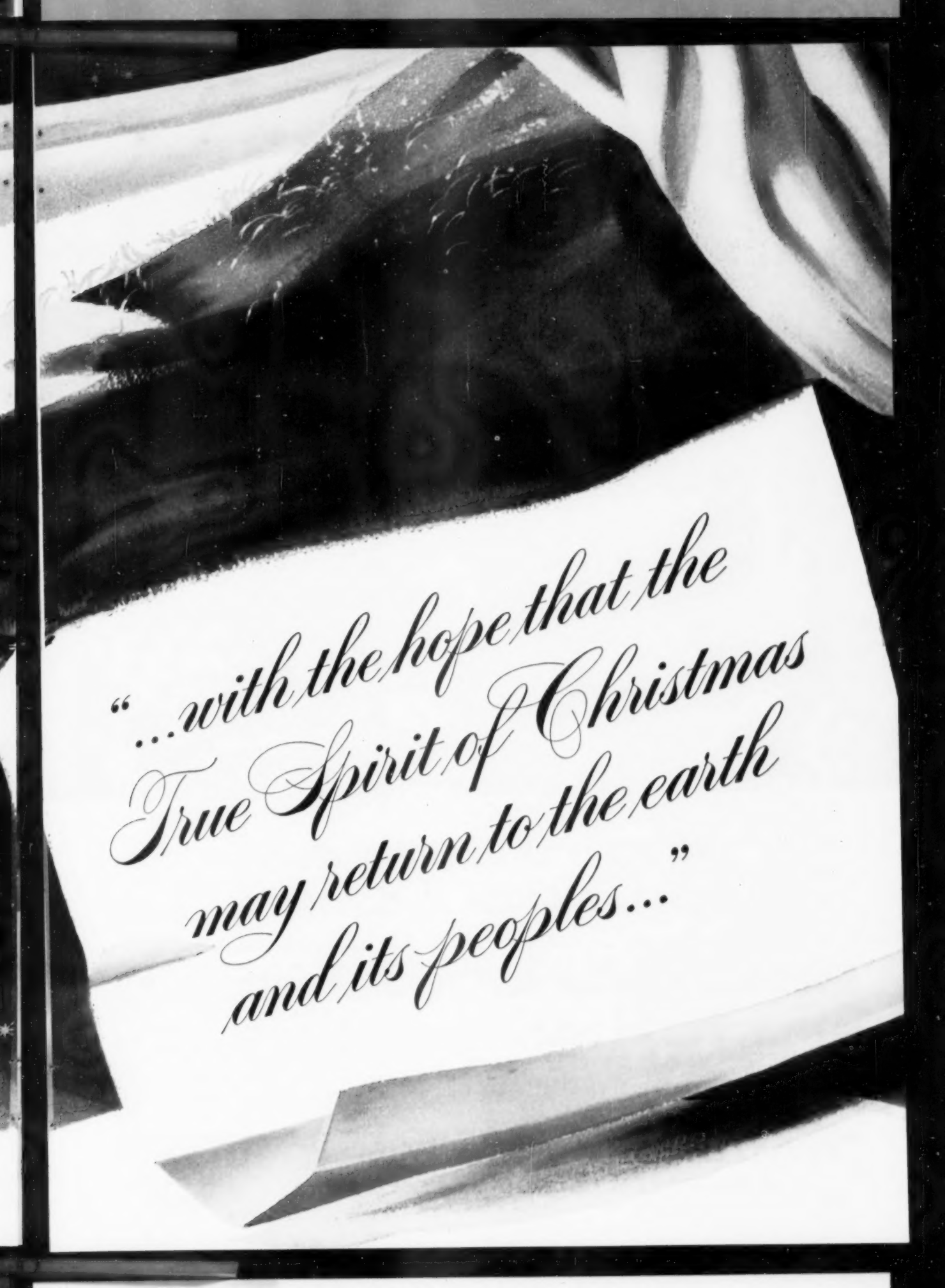
Natcos perform all kinds of drilling, boring, facing and tapping jobs in every conceivable combination and sequence.

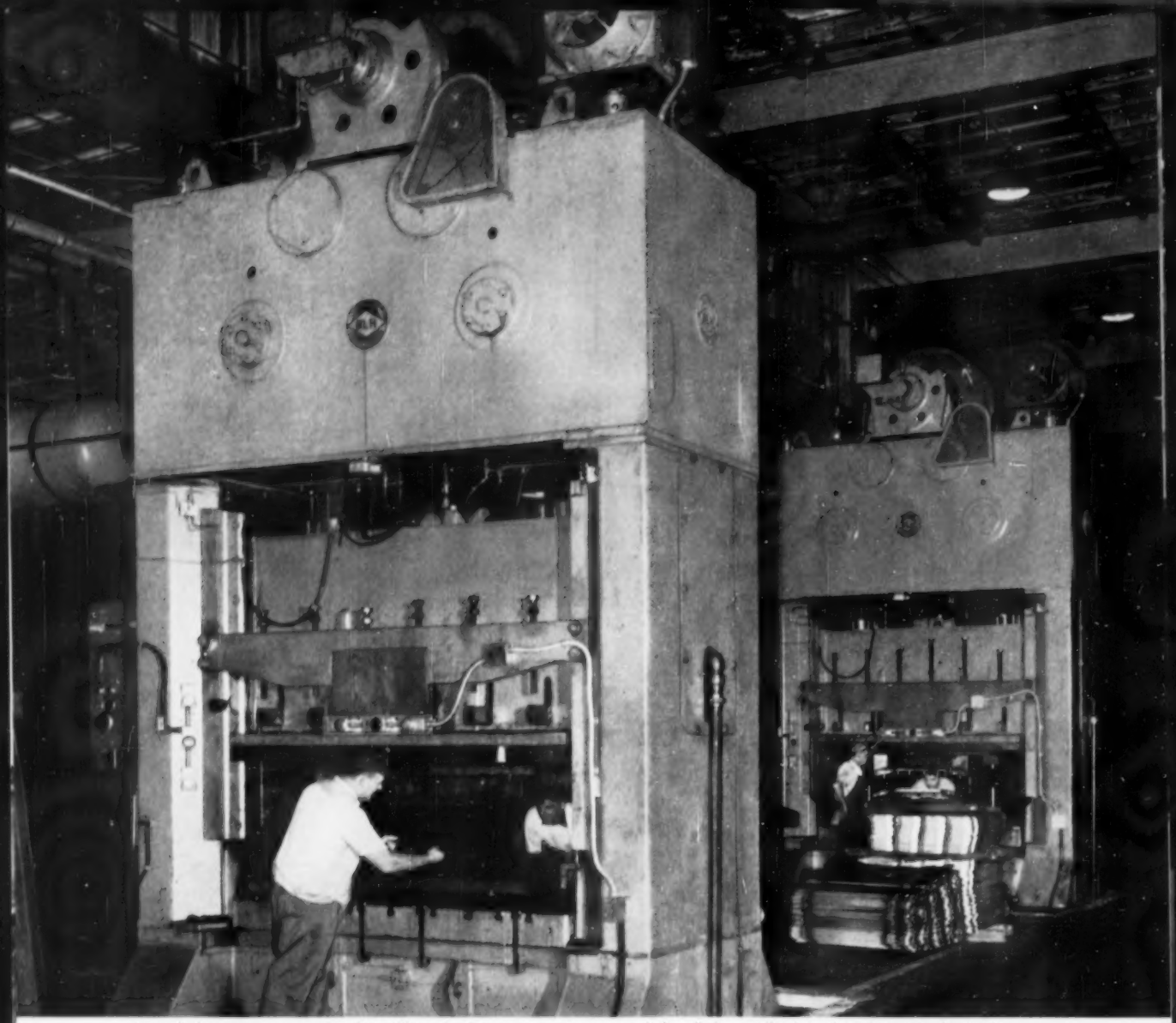
Ask the Natco Field Engineer about the newly perfected tape control systems for Natco production tools.

National Automatic Tool Company, Inc.

Richmond, Indiana ***Multi-spindle drilling, boring and tapping machines. Special machines for automatic production. Call Natco Offices in Chicago, Detroit, New York, Buffalo, Philadelphia, Cleveland, Los Angeles; distributors in other cities.***

MORSE TWIST DRILL & MACHINE COMPANY · NEW BEDFORD, MASS.
A DIVISION OF VAN NORMAN INDUSTRIES, INC.


"...with the hope that the
True Spirit of Christmas
may return to the earth
and its peoples..."



Pictured above are two new Hamilton 400-ton 2-point eccentric presses recently installed at Midland Steel Products, Cleveland, Ohio.

Versatility of Hamilton presses praised by Midland Steel Products

Four new Hamilton-built production presses were recently installed in the frame plant of Midland Steel Products, Cleveland, Ohio. Assistant to Plant Engineer Haldon R. Falquet describes these presses as "extremely versatile and flexible." Currently they are producing parts for 1958 model cars, but they are designed to accommodate the still larger parts now on the drawing boards for 1959 and 1960 models.

Mr. Falquet reports that in his experience there are numerous applications where Hamilton Presses "most often have proved satisfactory in meeting Midland's demands for the required tonnage, shut height, stroke and clearance between columns which enable us to meet our customers' specifications." One of the many Hamiltons in service at Midland is a 4000-ton press—the largest of its kind in the country—and turning out huge side rails for trucks and buses in a single hit.

Let us discuss your press problems with you. Perhaps our know-how in press building can save you money or improve your product—or both!

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

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FOR THE FIRST TIME, A BASIC MANUFACTURER OF RESINS OFFERS A COMPLETE LINE OF PLASTIC TOOLING MATERIALS—

RCI POLYTOOL

The Reichhold POLYTOOL line of plastic tooling materials includes epoxy, polyester, phenolic and polyurethane resins; resin compounds and hardeners. Reichhold is a leading manufacturer of synthetic resins. This means outstanding quality control... your assurance of uniform dependability... materials tailored for casting, laminating and other techniques used in all types of plastic tooling. Write to RCI for full details on the POLYTOOL line and let RCI's specialists help solve your plastic tooling problems.

Creative Chemistry . . . Your Partner in Progress

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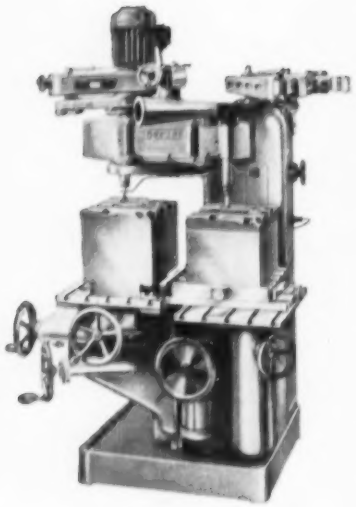
Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sulfuric Acid

Precision Machine Tools
For *Every* Metal Working Need



Deckel KF Universal Pantograph Die Sinker For 2- and 3-Dimensional Work

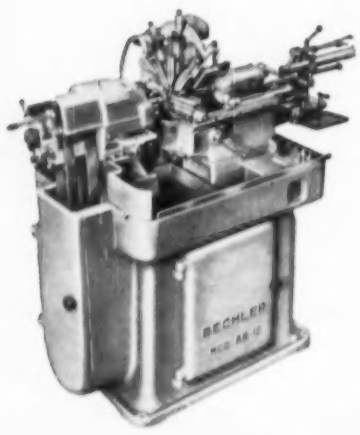
At Cosa you can choose from a complete selection of the world's finest machine tools and metal working equipment — for production line or tool room use. Standing behind every Cosa machine is a nation wide sales-service organization that offers you:

Sales Engineering — Machine tool experts will assist you in selecting the right equipment for your production needs.

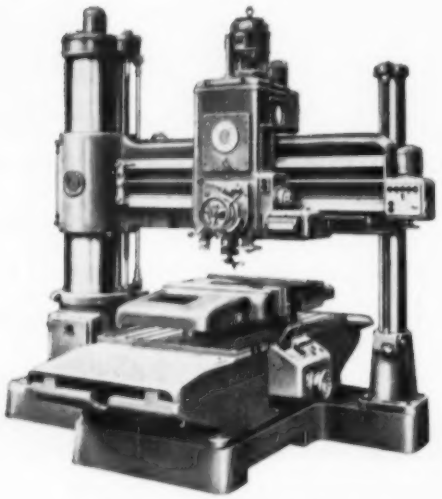
Installation — Factory-trained technicians will supervise installation, check performance, and instruct operators for best results.

Guarantee — Each Cosa machine is guaranteed against defective workmanship or materials for one year after delivery.

Service — Cosa's competent staff of skilled servicemen will help you to maintain peak performance — with quick delivery of spare parts.



Bechler Swiss Automatic AR-10 With 8-Tool Drum Turret



Kolb Optical Jig Borer For Positioning Workpieces To Within .00005"

CHECK COSA'S COMPLETE LIST FOR *YOUR* TOOLING NEEDS

- Automatic Screw Machines—Swiss
- Balancing Machines
- Bending and Forming Machines
  - Wire
  - Roll
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  - Jig
  - Precision
  - Vertical
- Cam Cutters
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- Chain Making Machines
- Clamps
- Drilling Machines
  - Horizontal
  - Multi-Spindle
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  - Upright, Single Spindle
- Dynamometers
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  - 2- & 3-Dimensional Pantograph
- Gages, Comparators
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- Gear Grinders
- Gear Hobbers
- Grinding Machines
  - Cam & Contour
  - Plain Cylindrical
  - Drill, Tap and Flute
  - Splines
  - Thread
  - Tool & Cutter
  - Universal
- Jig Borers
- Keyseaters
- Lathes
  - Automatic & Semi-Automatic
  - Bench
  - Double End
  - Engine & Tool Room
  - Facing & Right Angle
  - Gun & Shaft Boring
  - Special
  - Vertical Turret
- Milling Machines
  - Contour
  - Die Sinking
  - Plain
  - Planer
  - Tool Room
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- Straightening Machines, Wire
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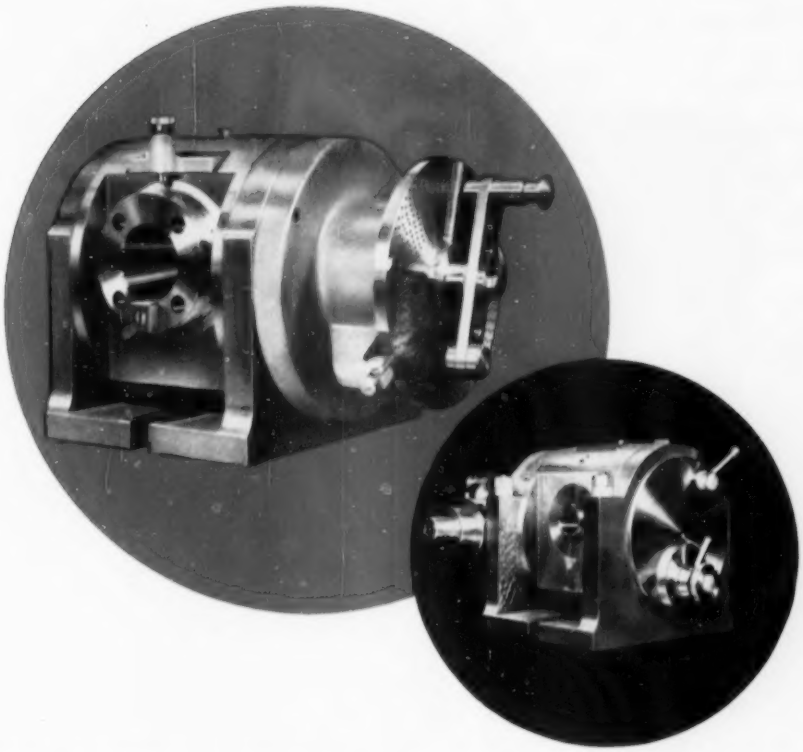
COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.



Rear View

CINCINNATI DIVIDING HEADS

Set a Higher Standard for your Toolroom Work

Ruggedness and a high degree of accuracy are skillfully combined in the new CINCINNATI Dividing Heads. They're as much at home in a heavy helical milling setup as the light duty setups ordinarily associated with high precision equipment . . . they're handy to have around for many types of inspection jobs. And here's another advantage . . . it will not be necessary for you to change a single engineering drawing or methods procedure. The index plate and sector on the new CINCINNATI Dividing Heads are the same as before, and the worm and wheel ratio remains at 40 to 1. ¶ Would you like to know more about the new CINCINNATI 10", 12" and 14" Dividing Heads? Write for publication No. M-1924.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Design Highlights

- Precision Ball-Bearing Spindle
- No. 50 Series Spindle Taper
- Milling Machine Type Spindle Nose
- Angular Vertical Swivel
- 360° Peripheral Clamping
- Direct Indexing on Spindle Nose
- Completely Enclosed Headstock

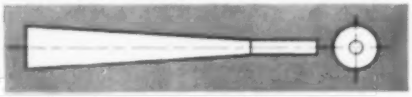
CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • SPECIAL MACHINE TOOLS • METAL FORMING MACHINES • HARDENING MACHINES • CUTTING FLUID • GRINDING WHEELS

How much are you paying for the machine that isn't there?

Because a Torrington Rotary Swaging Machine shapes work by reduction instead of cutting metal away, you can often save on both material and time by swaging parts you are now machining.

This part, for example, was formerly turned from brass bar stock. When swaged from tubing, stock weight was reduced 83%, and the work cycle cut from 86 seconds to 12 seconds!



You can put many operations on a Torrington Swager—pointing, tapering, reducing, sizing, forming inside contours and threads. With sizable savings on operations like these, your swaging machine will pay for itself in a short time.

See for yourself what swaging is and what it can do. Let us show you our new, 20-minute, full-color film on swaging. And write for our catalog on Torrington Rotary Swaging Machines.

THE TORRINGTON COMPANY • Swaging Machine Division
444 North Street, Torrington, Conn.

TORRINGTON ROTARY SWAGING MACHINES

HERE'S PROOF

WITH EX-CELL-O BUSHINGS YOU GET TWICE THE AVERAGE BUSHING LIFE!

This was the result of competitive bushing tests recently conducted at a large automotive plant:

BRAND "A" 1,045 PIECES
BRAND "B" 1,910 PIECES
EX-CELL-O 2,255 PIECES
(per .001" of wear)

57-105

Ex-Cell-O Bushings outlast all others —give up to twice as much production

As a cost-conscious manufacturer, you recognize the importance of these results—independently arrived at—to your own operations. If you are not now specifying bushings stamped "XLO", you may be spending up to twice as much as you need be for every bushing you buy.

You certainly owe it to yourself—on the basis of this test alone—to discover the very substantial savings Ex-Cell-O bushings offer you. Test them—in your own plant—against any, or all, competitive bushings.

Send your order to Ex-Cell-O Corporation at Detroit, New York, Downey, Cal., Lima, Ohio, and London, Canada. You'll get immediate shipment. Write for an Ex-Cell-O Drill Jig Bushing Catalog today.

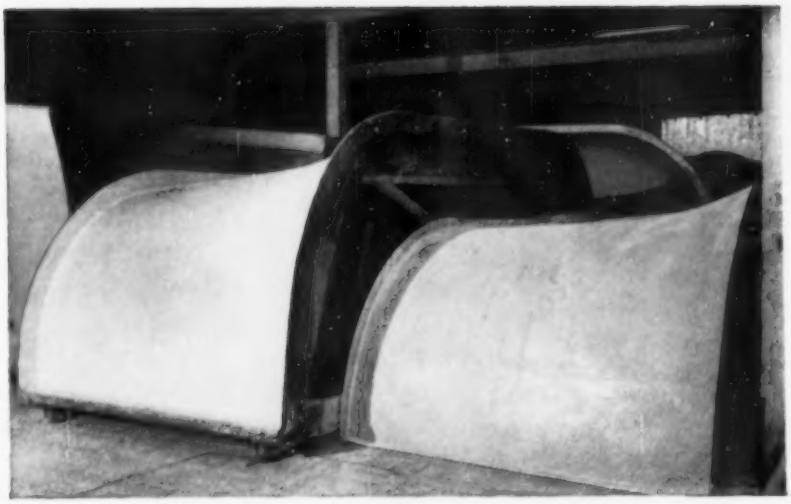
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION
XLO

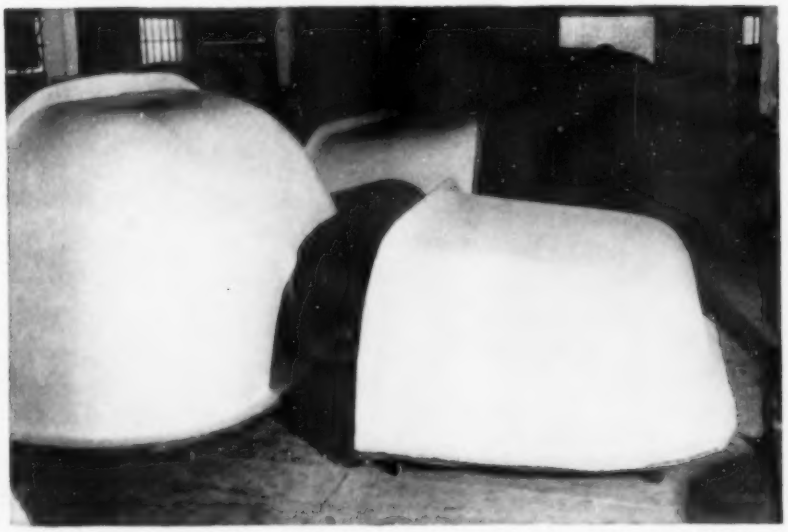
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Made with
BAKELITE
TRADE MARK
Epoxy Resins...

Giant tools ...small prices



ABOVE, plastic tool, on casters, is shown with reinforced plastic swimming pool section on the right that was formed from it. **BELOW,** other tools for shaping various sections of the pool.



Molds shown were made by W. R. Chance & Associates Inc., Arlington, Va., from epoxy compound supplied by Marblette, Long Island City, N. Y.

IT TAKES SOME PRETTY BIG TOOLS to shape a swimming pool made of reinforced plastic sections. The tools have to be light, durable, accurate and low in cost . . . the same advantages you want for metal-working tools.

These tools here can point the way to considerable savings on jigs, checking fixtures, Keller models, and other metal-working assembly units, large and small. Made of glass cloth and tooling compounds based on BAKELITE Brand Epoxy Resins, they are reported to be among the world's largest plastic tools. They have already been in service for three years and are still in excellent shape.

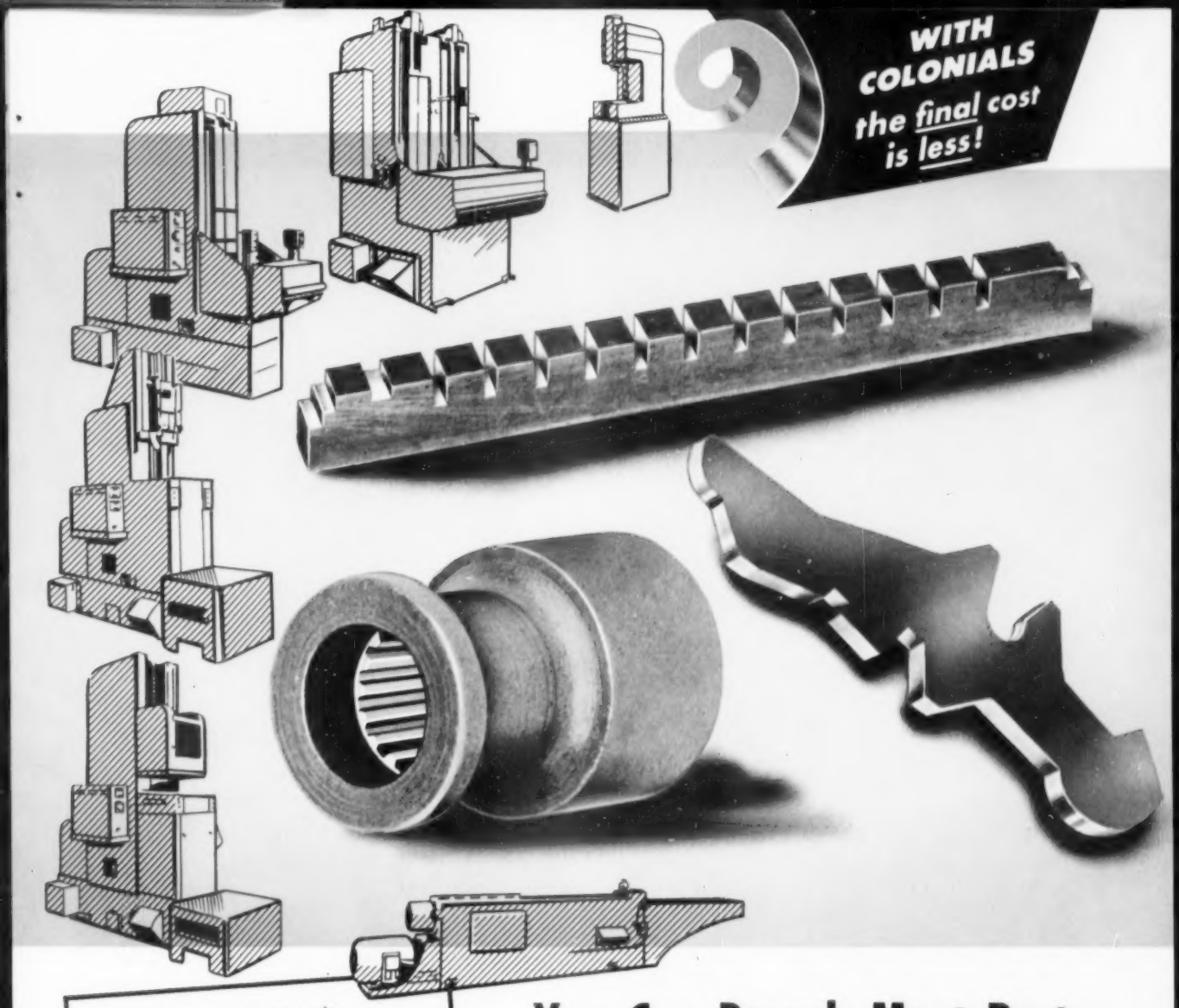
In another material, their cost would be prohibitive. Their ease of handling and dimensional stability are remarkable. If designs change, the tools can be machined or patched to fit.

Learn how you can profit from the economy and efficiency of tooling with BAKELITE Brand Epoxy Resins. Write Dept. AM-181.

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The terms BAKELITE, UNION CARBIDE and the Trefoil Symbol are registered trade-marks of UCC.



Some of COLONIALS Standard Lines:

Ram-Press — Versatile broaching machines at reasonable cost. Four models in 4, 6, and 10-ton capacities with 24 and 36-inch strokes. Ask for Bulletin RP.

Universal Horizontals — Designed to do both internal and surface broaching operations. Models include sizes of 6, 10, and 15 ton with strokes of 54, 60 and 72 inches. Request Bulletin HS.

Utility Press — Low-cost, high-quality machines available in a range of sizes from 4 ton to 10 ton in a variety of strokes. For details write for Bulletin PB.

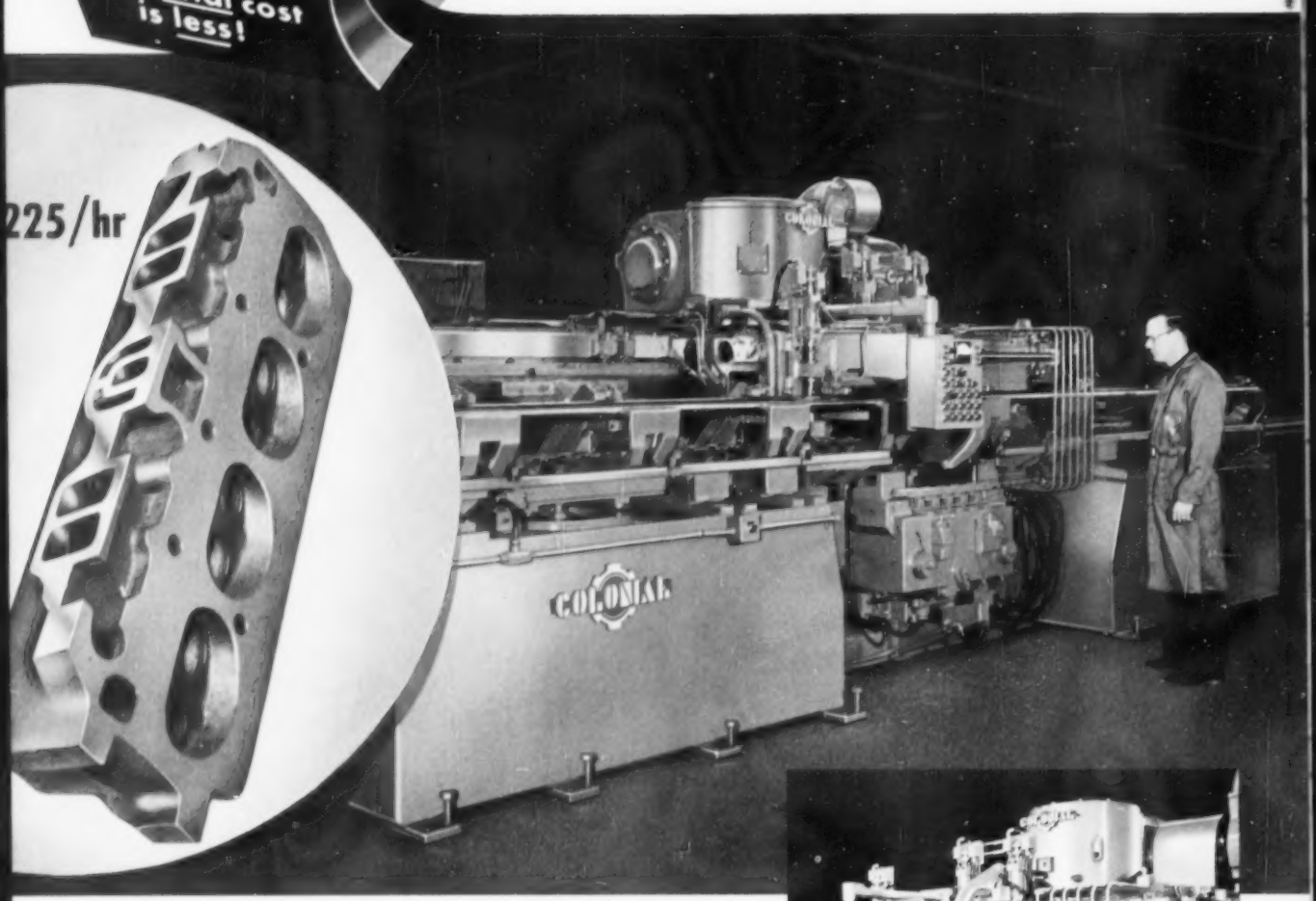
"Junior" Press — Push or pull assembly and broaching operations. 1, 2 and 4-ton sizes in bench and floor types. Get Bulletin VJ.

You Can Broach Most Parts on Standard COLONIALS

Broaching is the fastest method of accurate metal removal available to industry today. No matter what the part, always ask yourself "can it be broached?" You can use broaching on all kinds of jobs—internal and external, simple and complex, on big or small parts in all kinds of metals in large or small quantities. And to slash your capital investment, use a broaching machine from **COLONIALS** standard line. Send us your part prints. We'll tell you which broaching machine will cut your costs the most on quantities you need. No obligation.

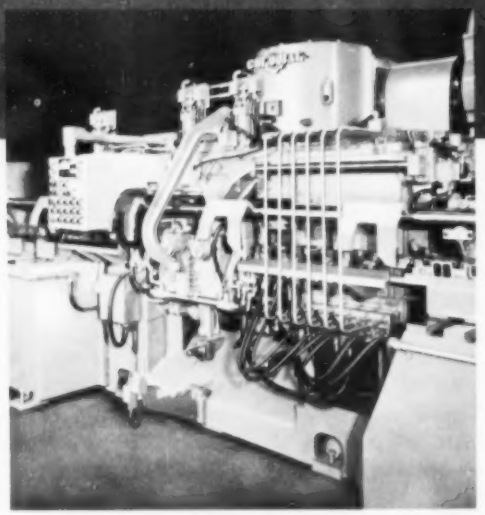
COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

WITH COLONIALS the final cost is less!



Automated Horizontals for Faster Surface Broaching

Automated broaching is one of **COLONIALS** strong points—for with automation you can get even higher production efficiencies from standard broaching equipment. A good example is shown here—an automated version of the popular **COLONIAL** ElectroGear horizontal broaching machine. It broaches 225 cylinder heads per hour at 130 sfpm to ± 0.001 in. tolerance using carbide broaches. Loading, machining, and unloading is completely automatic. Where costs are important, **COLONIAL** surface-broaching methods like this are becoming evermore widely used. Keep up with the latest applications. A letterhead request for BROACHING NEWS makes it easy. We'll send it regularly.



Designed and built entirely by **COLONIAL**, *this ElectroGear, Model 60-90 is a powerful, high-speed machine with a fully automatic broaching cycle. Available in strokes up to 240-inches. Chip removal is automatic. For complete details on these remarkably smooth-running machines, write for Bulletin HM-56.*

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.

PRECISION PERFORMANCE...

To the piano virtuoso,
precision performance means that vital link
between his talent and the instrument.

To tap users, precision performance means
production-line continuity, better threaded parts,
increased tap life . . . and BAY STATE!

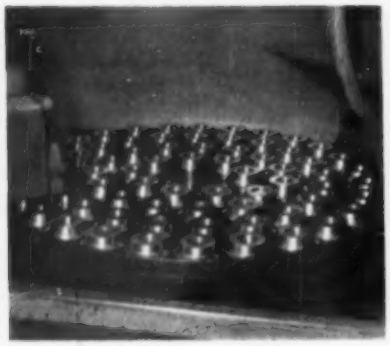
BAY STATE TAPS

Bay State Tap & Die Company

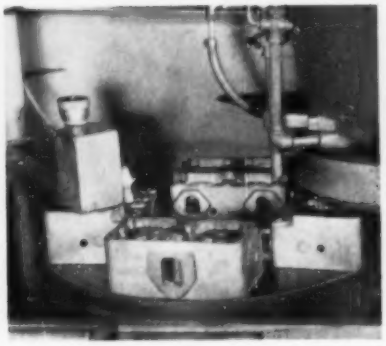
Mansfield, Massachusetts

On the nearby shelves of your Industrial Supply Distributor

Whatever your grinding job may be...



200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits ± .001".

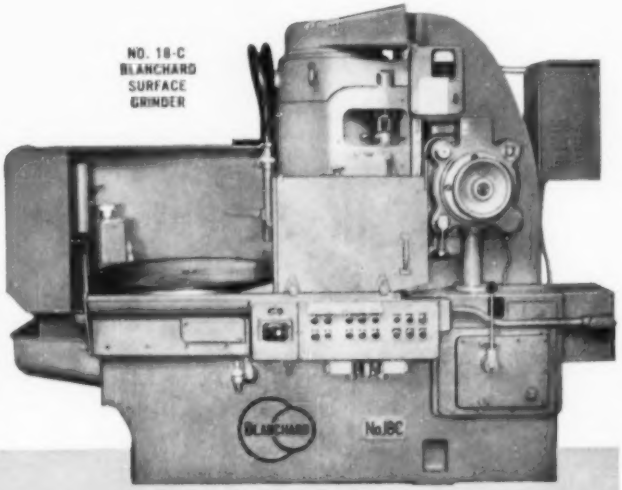


Tops of cylinder heads ground 21 per hour; stock removal 3/16" to 1/4". Bottoms 55 per hour; stock .012"; limits ± .001".

56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

for best results...

The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



Put it on the Blanchard

The 18-C Automatic Cycle...

Moves chuck to grinding position and starts it rotating

Starts wheel rotation and coolant pump

Provides rapid wheel approach to work

Engages power down-feed at preset rate

Changes to fine feed just before finished size is reached

Stops feed when work is to size —"sparks" out. Raises wheelhead

Stops wheel, coolant pump, and chuck

Moves chuck to loading position—demagnetizes chuck

Can be changed quickly to manual operation

Automatically Controls Size!

Send today for your free copy of 18-C folder.

BLANCHARD

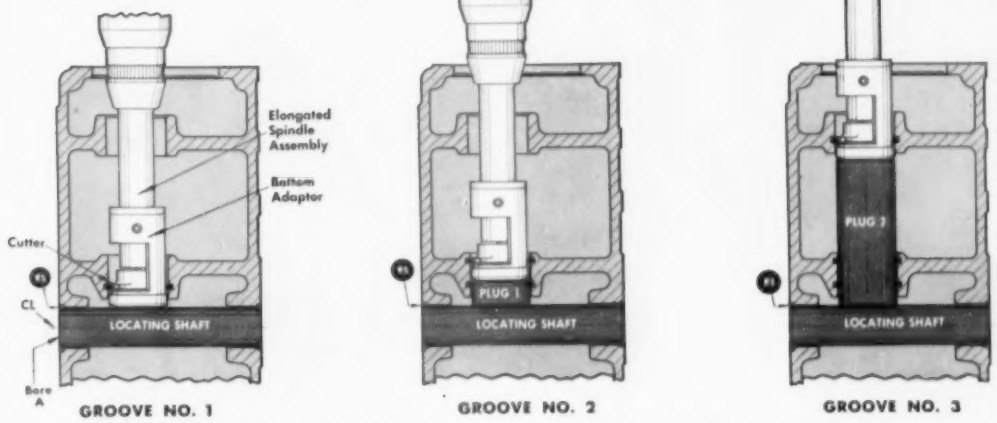
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-58

Waldes Truarc Grooving Tool pays for itself with big savings on one small run!

3 internal recesses cut in bores of 100 castings in 17.5 hours... including set-up time



GROOVE NO. 1 GROOVE NO. 2 GROOVE NO. 3

The job shown above called for three grooves located at prescribed distances from center-line CL of bore A. Depth and location tolerances: ±.0015".

Size and shape of the castings made nesting difficult for a boring bar operation. Exterior surfaces were unmachined, making alignment complicated. With two grooves over 7" from the housing's open end, boring bar chatter could have caused costly rejects.

To overcome these obstacles a Waldes Truarc Grooving Tool was equipped with an elongated spindle assembly and bottom adaptor. The tool was mounted in a drill press, the castings in a large vise. Grooves were then cut as follows:

Groove No. 1: A locating shaft was inserted into bore A as a reference surface and the tool piloted into the housing until the bottom adaptor banked on the shaft. The tool is designed so that the cutter rotates in a neutral position until additional downward pressure is applied. It then moves into cutting position until preset groove depth is reached, after which the tool idles. Release of pressure returns the cutter to neutral so that the tool may be withdrawn.

Groove No. 2: Plug 1 was inserted into the bore over the locating shaft and the tool again piloted into the bore. The groove was then cut the same way as Groove No. 1.

Groove No. 3: Plug 2 was substituted for the first plug and the cutting operation repeated.

All 300 grooves were held to prescribed tolerances. Set-up time: exactly 11 minutes. Operating time: 1050 minutes for 100 castings. Rejects: none!

No recessing problem is too tough for the amazingly versatile Waldes Truarc Grooving Tool. It's so simple even unskilled labor can use it accurately.

Write for a 20-page manual containing full information on Waldes Truarc Grooving Tool.

WALDES

TRUARC®

GROOVING TOOL

U.S. Pat. 2,411,426.

WALDES KOHINOOR, INC., 47-16 Austel Place, L.I.C. 1, N.Y.

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Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. TE-129

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END MILLS ARE OUR BUSINESS . . .
NOT A SIDELINE

TO BEST SERVE YOUR NEEDS

For over twenty years our designing and manufacturing abilities have been devoted to producing highest quality end mills. Because end mills are our business, we realize that universal acceptance of our product is obtained and maintained by continuously supplying the best end mills available.

Putnam manufactures and stocks over 1400 standard types and sizes of end mills. Thus, you can quickly and economically select the exact size and type to best meet your needs.

Putnam Distributors from Coast-to-Coast carry large stocks of standard end mills. Contact your neighbor, the local Putnam Distributor, he will recommend the best end mill for specific jobs, give you personalized service, and quickly supply your needs with the finest end mills obtainable.

PTC

PUTNAM

TOOL COMPANY

2981 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

New Model D Single Dial CompAIRator. Available with instrument mounted gaging; or for remote connection to machining operations for in-process or post-process gaging.

New!

New Model E. For the first time, a low-cost version of standard Taft-Peirce circuits so you can cut costs by using air gaging for many more inspection operations. Has external tolerance hands and compact cabinet. Same accuracy, same dependability — the biggest air gage value on the market.

HIGH PERFORMANCE Air Gage Line

...the TAFT-PEIRCE Model D CompAIRator

Here's another big improvement in air gaging. The well-known CompAIRator has a completely new functional design that gives you 3 big advantages: — makes air gaging easier to read, easier to use and easier to trust!

EASY TO READ — Special visor and slanted face cuts glare and reduces parallax — speeds the gaging operation. Dial has full 180° linearity.

EASY TO SET UP AND USE — Zero and range setting knobs are within easy reach of the operator. Plus, compact chassis, and simplified dial and magnification changes. The Model D can be set and used at any angle, moved easily because it's light. Can be racked or modulized.

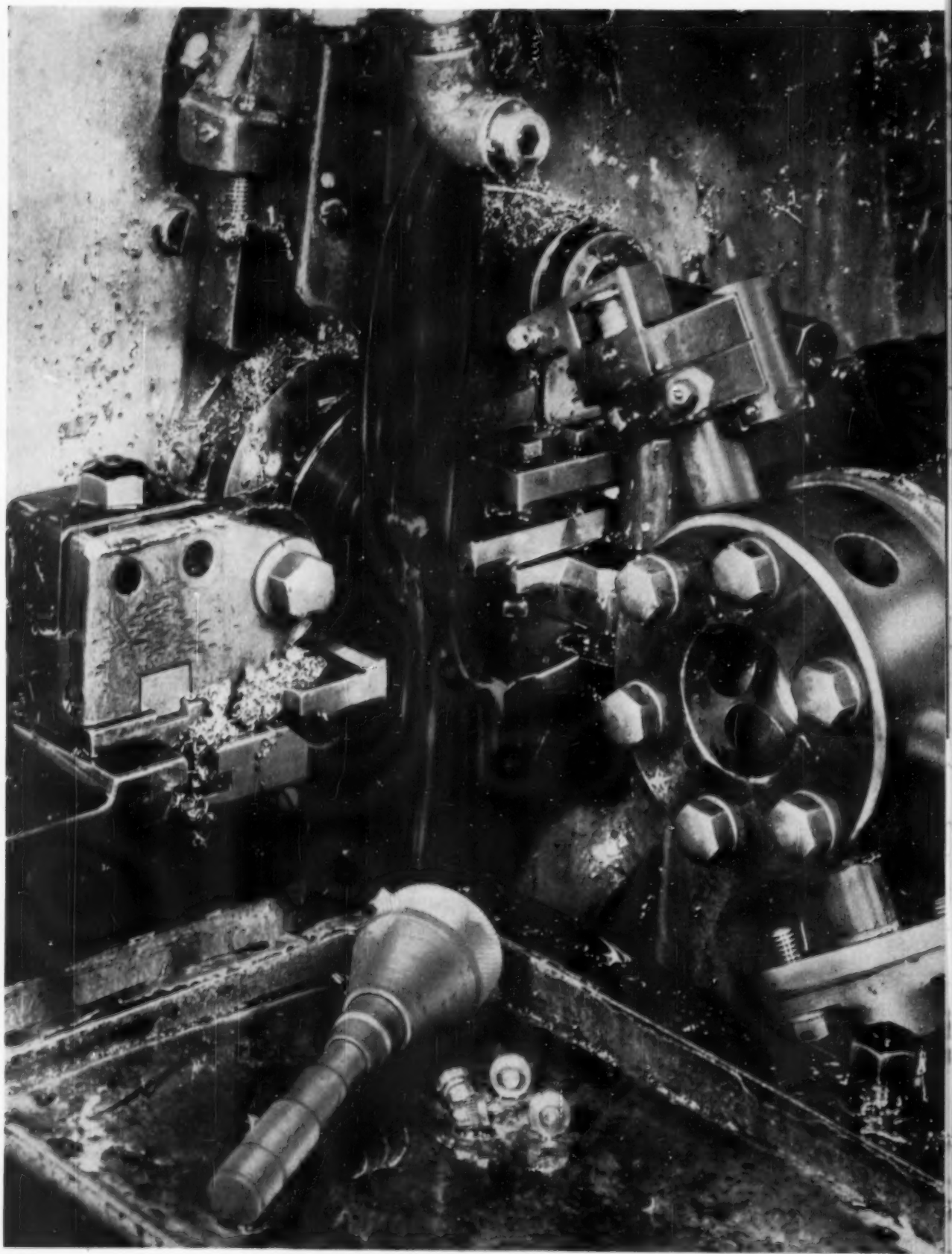
EASY TO TRUST — Yes, you can place full confidence in the new design because it uses the proven T-P Velocity-Venturi Circuit. Repeats readings without variation, has exceptional speed of response and is readily adaptable to many special uses, including wide tolerance gaging.

Modernize your gaging with this new CompAIRator. Or, ask a Taft-Peirce representative to demonstrate the new T-P CompAIRator — you'll be amazed at the performance.

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

T-P Means TOP Precision



The tool is cutting steel, but the oil is cutting costs . . . because it's

GULFCUT!

Gulfcut 11D at work in J&L turret lathe at M&O Manufacturing Company, Wallingford, Connecticut.

This automatic screw machine uses Gulfcut, which contributes to longer tool life, finer finishes. Dictaphone Corporation has been using Gulfcut exclusively for the past 10 years.

It's Gulfcut 31C, to be exact—the sulfurized-mineral-lard cutting oil used at Dictaphone Corporation, Bridgeport, Connecticut. Mr. Joseph A. Maloney, Process Engineer, says: "We get steady production at an even rate, using Gulfcut—hold tolerances as close as 3 ten-thousandths—get the combination of lubrication and cooling that leads to longer tool life, better finishes, fewer rejects!"

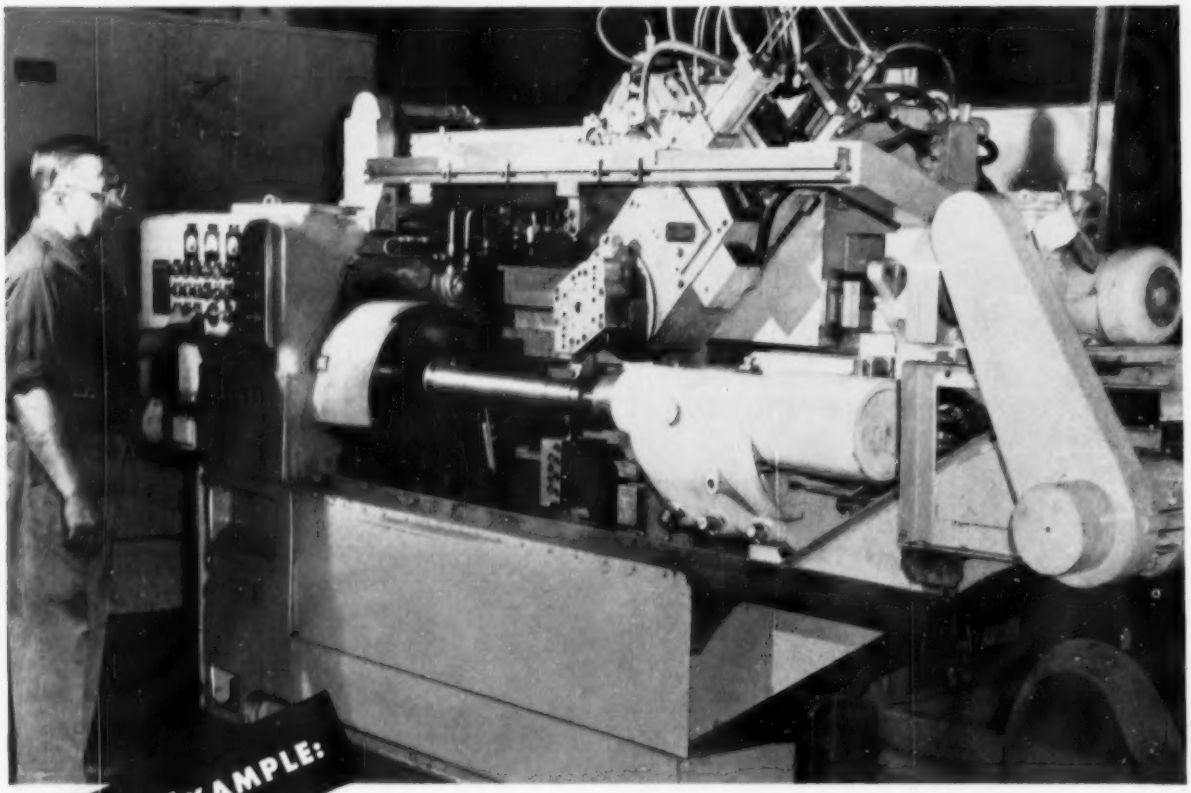
Dictaphone is only one of scores of companies that are trimming machining costs through the use of Gulfcut cutting oils. We think Gulfcut can improve your machining practice, too. In Gulf's complete line, there's a Gulfcut cutting oil for your every metal cutting need. Each is specifically compounded to meet specific requirements. Each is scientifically made to help you cut costs. And your Gulf Sales Engineer will gladly recommend the proper oils for you. Just contact your nearest Gulf office.

Gulf Oil Corporation
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Before you buy any turning equipment see what you get from SUNDSTRAND



FOR EXAMPLE:

This SUNDSTRAND Tracer Lathe simplified operation, reduced costs and improved accuracy and finish!

This one Sundstrand Automatic Tracer Lathe installed at International Harvester's Tractor Works replaced two lathes previously required for the turning of bevel pinion shafts. Increased production, reduced set up time, closer tolerances, simplified operation, reduced costs, and finer finishes are the benefits of this change to Sundstrand.

Changeover time was reduced from an average of 8 hours to 1 hour on the multiple small lots turned on this lathe. Rough forgings are ruff and finish turned in one set up using an automatic indexing tool turret equipped with a ruff and finishing tool. Finishes were improved 50% over previous machining method and tolerances are consistently held within the specified limits to eliminate rework.

All of these combined features add up to a production increase, reduced cost and overall simplified operation.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

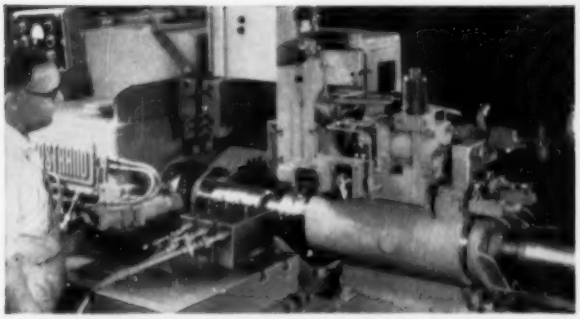
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

SUNDSTRAND

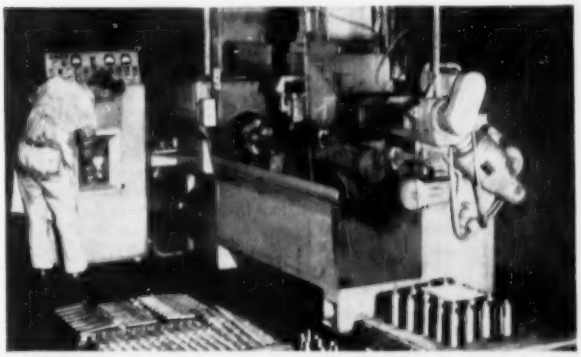
"Engineered Production"

INCREASES EFFICIENCY

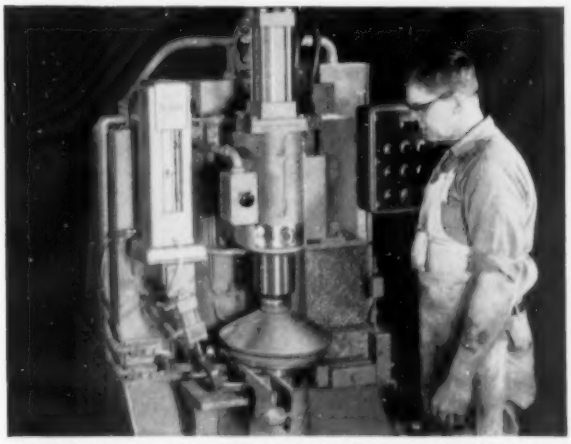
. . . because the choice of the processing method — including the machine and tooling — is based on years of experience in solving every type of machining problem. Because Sundstrand builds a complete range of tracer, multiple tool, vertical and special lathes as shown on these pages, you will obtain the *best machine for your specific needs,* one that includes advanced design ideas for outstanding turning efficiency.



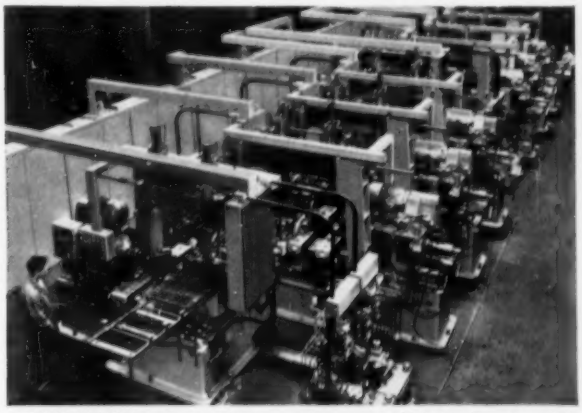
MULTIPLE TOOL TURNING—Where a variety of turning, boring, facing, and forming operations are required on a particular part, Sundstrand automatic lathes can be provided with a combination of tools mounted on front, rear, and overhead carriages, permitting the maximum number of surfaces to be machined in a short machine cycle.



PUNCH CARD CONTROL—A few of the parts being turned on this punch card controlled automatic lathe are visible in foreground. Both setup time and mechanical skill requirements are held to a minimum with this machine while high-quality work is assured.



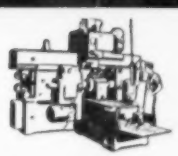
VERTICAL TURNING—This Sundstrand vertical automatic production lathe is basically a standard machine with platens for mounting turning or grooving slides, multiple tool slides, or tracer slides. Floor space requirements are reduced materially, and automatic handling can be applied readily. One operator can readily handle several of these machines.



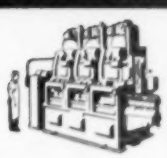
SPECIAL TURNING—Where production requirements are high, Sundstrand special automatic loading process lathe lines, like this one for automotive camshafts, insure high output of top quality work. The part goes through the complete line without any manual handling whatsoever.

More facts about Sundstrand turning equipment are available in Bulletin 786. Write for your copy today.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



SUNDSTRAND
Machine Tool Co.
2540 Eleventh St. • Rockford, Ill., U.S.A.

"Engineered Production" Service

FOR BROACHING

It takes all 3

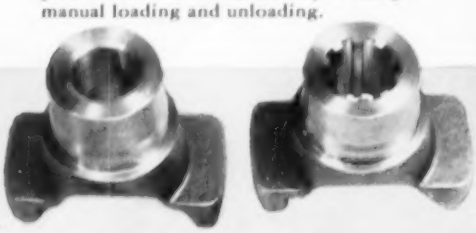
American's "Engineered Production" Service . . . gives the broach user the complete three part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

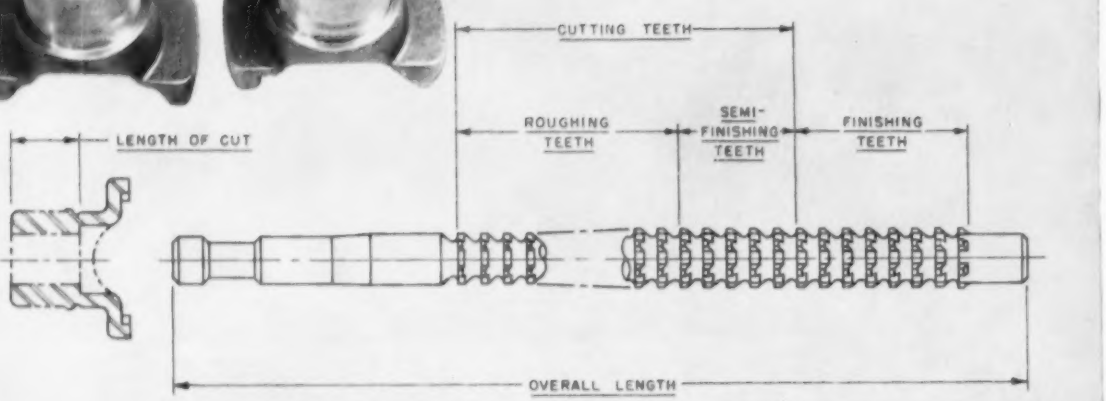
THE JOB — Broaching splines in two different end yoke parts — four at a time — with a high production rate required.

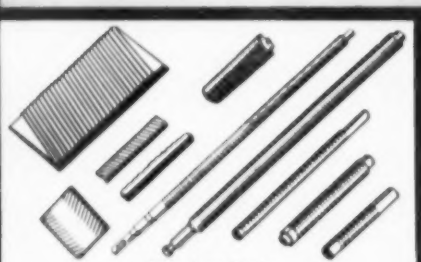
THE RESULT — 480 completed parts per hour in a semi-automatic cycle using manual loading and unloading.

1 PROPER BROACH TOOL DESIGN

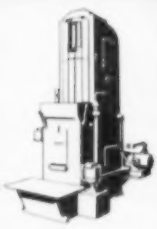
Top quality results on any broaching operation require starting the job with design of the broaching tool. In solving this all important first step, American Broach considers stock removal, length and width of cut, finish, tolerances required, etc. Because the broach and machine are designed to operate as a team, high quality work and long tool life result. In this installation, radial location is maintained between the broach spline and the half round in the opposite end of the parts.



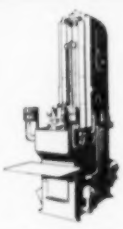




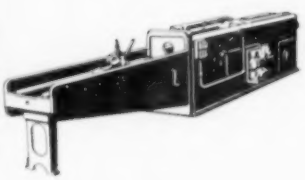
Broaching Tools



Three Way



Single Ram



Horizontal

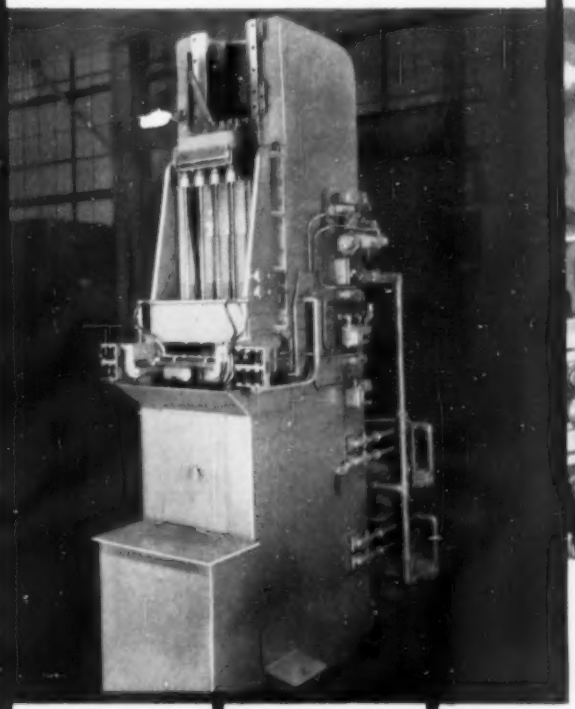
to give you peak broaching performance

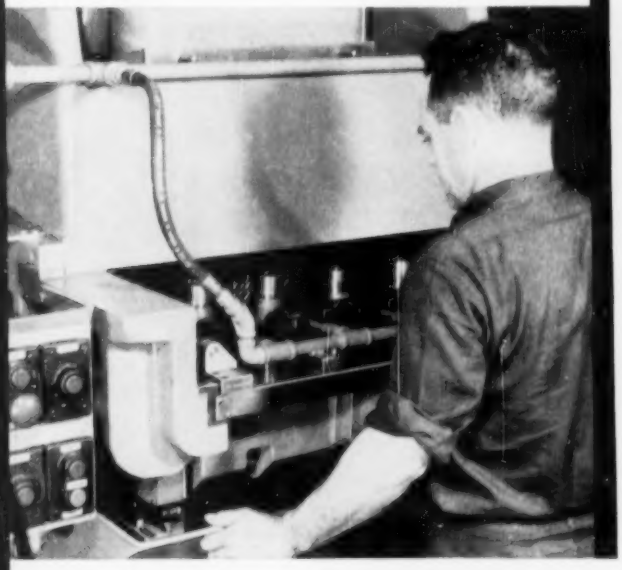
2 SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc., determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. This vertical pull up, 40-ton, hydraulic broaching machine is provided with a variable broaching speed up to 16 feet per minute.

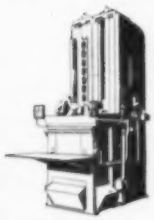
3 EFFICIENT FIXTURING

Whatever your parts geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. The operator unloads and reloads manually at the end of work stroke when work slide moves out with finished parts and broaches return to starting position. This installation again shows how American builds "skills" right into the tool, machine, and fixtures, enabling production schedules to be maintained even with inexperienced operators.

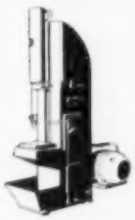




Write for American's Vertical Pull Up Bulletin A721 for more information on practical broaching methods by American.



Duplex Ram



Presses

SUNDSTRAND

American BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS

In the most forward position

...Hannifin valves

Our "NE" valve—one of several Hannifin 4-way directional air control valves. Ask your Hannifin man when to use it.

Persistent research is bringing Hannifin valves to the most forward position in the field of pneumatic controls. These valves are opening up new areas of progress for sequential automatic production.

The Hannifin valves you buy today incorporate the very latest results of never-ending testing and development. Versatility of application and dependability of operation are winning them their position of leadership.

See your Hannifin man. Find out for yourself why Hannifin air control valves are so rapidly becoming first choice for automatic operation.

AIR CONTROL

HANNIFIN

VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Company, 519 South Wolf Road, Des Plaines, Illinois.

ALLENPOINT will give you a bulldog grip at no premium in price!

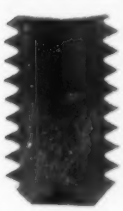
Allen's scientific redesign of the cup diameter on set screws gives greatly increased resistance to *withdrawal* torque. You can count on Allenpoint Set Screws to stay tighter longer, under heavy strain and vibrations. This dependable premium performance of Allenpoints is yours to use without increasing the cost of manufacturing your products.

Uniform Class 3A Threads

Allenpoints' smooth, uniform threads prevent off-lead conditions like Fig. 1. With Allenpoints, you have full, even contact between the engaging flanks of the threaded members (Fig. 2) –and a tight friction lock over the entire length of the Allenpoint Set Screw.

Fig. 1 Fig. 2

Strong, clean, deep sockets allow full wrenching leverage

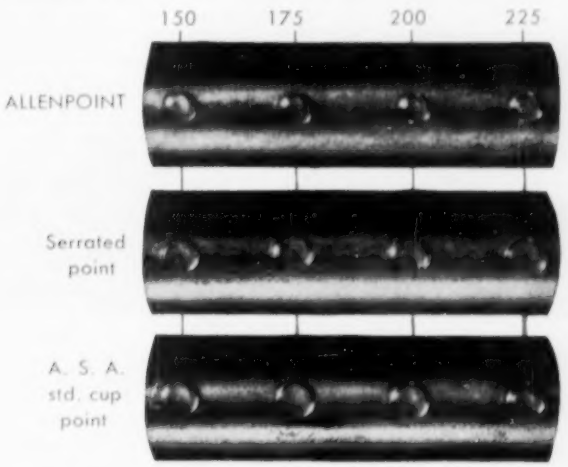


Sockets of Allenpoint Set Screws are cold forged to produce a deeper, smoother socket. No broach chips to interfere with proper seating of the key. This "pressur-forming" preserves the long steel fibers throughout the length of the screw–stronger walls allow maximum tightening torque.

One more full thread on ALLENPOINTS!

Allenpoint Set Screws have one more full thread than serrated point set screws. That means more holding power–especially important when you're using short lengths.

ALLENPOINT's performance compared for you



These actual-size, unretouched photographs show the cup pattern made by Allenpoints, serrated points, and A.S.A. standard cup point set screws in a 3/4" steel shaft. At each degree of tightening force, Allenpoints make a full circle pattern, penetrating deeper for greater holding power.

We'll be glad to send you more information and samples of Allenpoint Set Screws and other Allen Socket Screw products.

Stocked and sold by leading industrial distributors everywhere

ALLEN MANUFACTURING COMPANY
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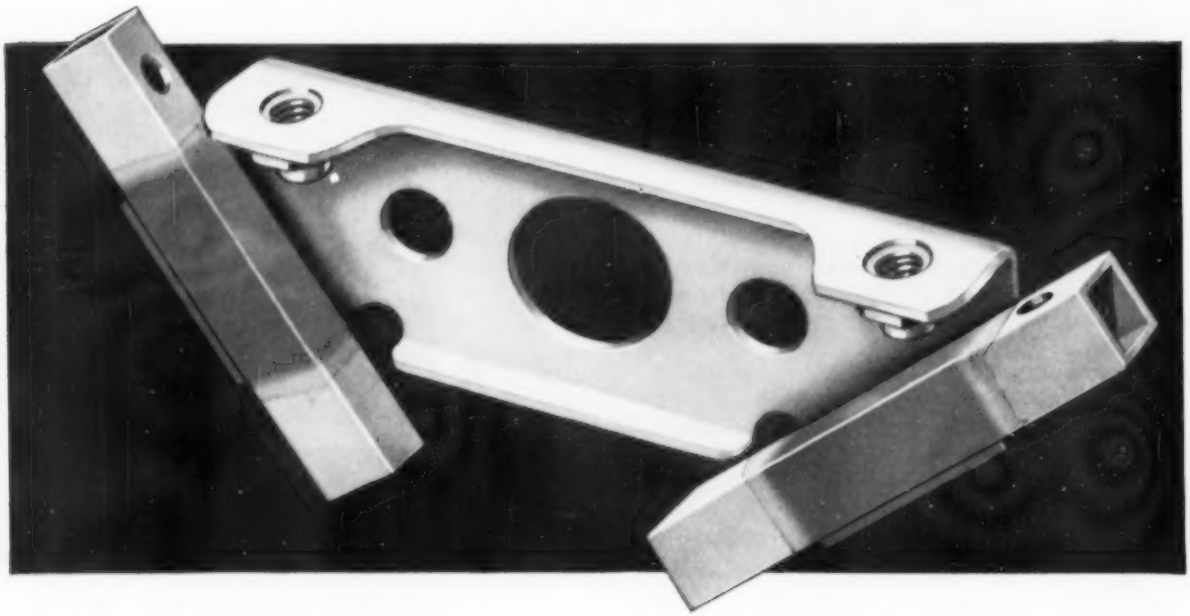
ALLEN HEAD

Jack & Heintz Saves $15.84 Per Hour...

with TOCCO® Induction Brazing



Brazing Costs Down—When Jack & Heintz engineers switched from torch brazing to automatic induction, brazing cost of these inverter brush mounts fell from $.05 to $.006 each—a reduction of 83% in direct labor costs alone! Additional savings result because less cleaning is required after TOCCO, and fuel costs are much lower, too.

Brazing Production Up—While costs dropped, production on the part zoomed—from 40 to 360 brazed assemblies per hour. Furthermore, rejects and scrap, formerly high, are now negligible.

Versatility—The part shown is just one of over 25 parts, large and small, which alert J & H engineers have converted from old-fashioned brazing methods to modern, automatic TOCCO. Overall brazing costs (TOCCO brazing versus former methods used) are down 75%—brazing speed, up 100%.

If the manufacture of your product involves brazing, heat-treating, forging or melting of ferrous or non-ferrous metals, don't overlook TOCCO as a sound method of increasing production, improving product quality and slashing costs.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

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Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering".

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Blessed Be Our Opportunities

Christmas is the time of year when we take a vacation from routine business problems and direct our attention to the broader and more basic problems which face all mankind.

At this time of year, the spirit moves us to be generous and to share with our friends—not only material possessions, but other things equally as important, such as hope, goodwill and faith. This feeling of generosity should not be just a seasonal thing, it must prevail throughout the year. Our efforts must continue if we are to meet the urgent calls for help of the sick, underprivileged and neglected.

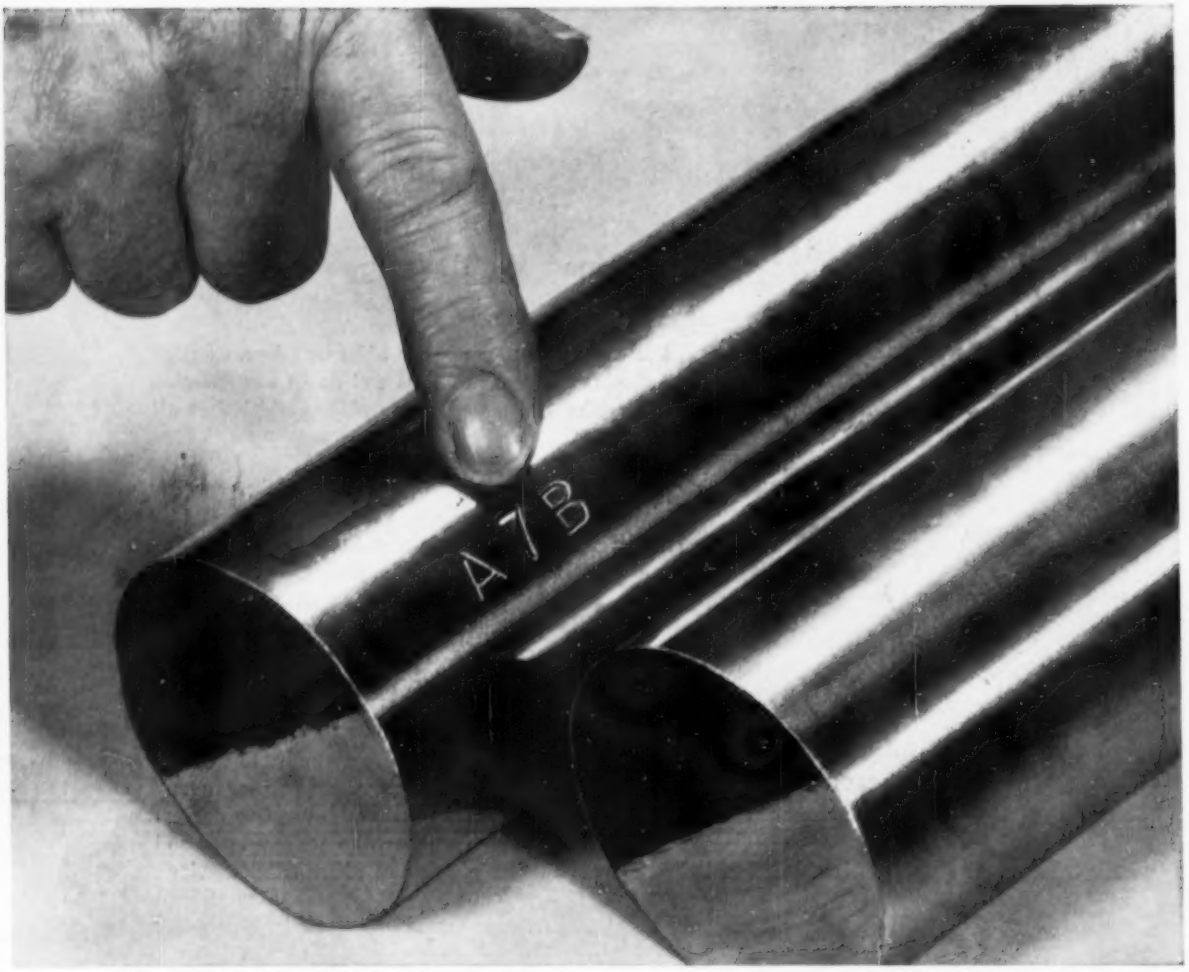
We can redouble our efforts in our religious undertakings, and we should bless our opportunity to worship peacefully in our own way. This is one privilege many other people on earth do not share with us. Our prayers must go out continually for those who are oppressed and living under a shadow of tyranny where religious views are controlled. Freedom will win out only when all men understand that religion means peace to all.

Since we are fortunate enough to have the privilege of sharing religious views, ideas and goodwill toward all, we must accept this privilege as a responsibility. Through such responsibility comes strength, which we need to better our own lives and the lives of others.

The Kingdom is given to us at this Christmas season for the claiming and the keeping.

H E Collins

PRESIDENT
American Society of Tool Engineers



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Two alloy steel bars of the same type can differ markedly in hardenability—if they come from different furnace heats. But with Ryerson 8-step quality control, there's no need to guess. Every Ryerson alloy bar is positively identified by heat number. You get a "heat history" report with every order.

Here's what the Ryerson report tells you:

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You can always be *sure* with alloys from Ryerson. On your next order, get the protection offered by the Ryerson Certified Alloy Steel plan. It costs no more. Call your nearby Ryerson plant.

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Principal products: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.

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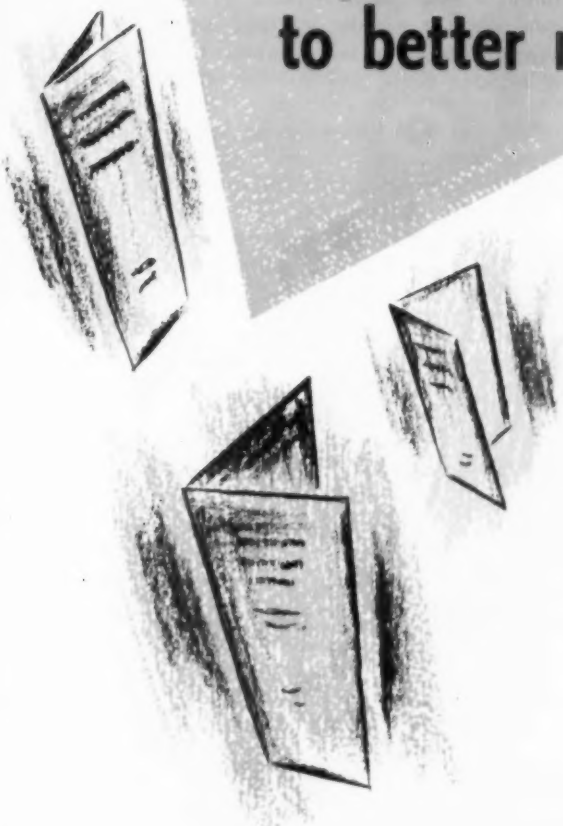
SUPERVISORY DEVELOPMENT PROGRAMS

...a practical approach to better management



By G. E. Keegan
Director of Industrial Relations
Package Machinery Co.
East Longmeadow, Mass.

LONG-RANGE SUCCESS of any company depends, to a large degree, on the caliber of its supervisors. Supervisory performance—efficient or inefficient—is reflected in company profit-and-loss statements. Recognizing this fact, most companies are always on the lookout for individuals with supervisory ability.

The role of supervisors in modern manufacturing plants is complex. Supervisors are responsible for meeting production deadlines and for product quality. They are also responsible for the over-all efficiency of the operations in their departments. In this capacity, they must have a knowledge of engineering, accounting, industrial relations and a host of other specialties. As managers of a team, they must also have the ability to plan, to coordinate and to lead.

Success in supervision is the result of training and experience. While on-the-job training and experience is important, the training process can be ex-

" . . . a supervisor plays many roles . . . "

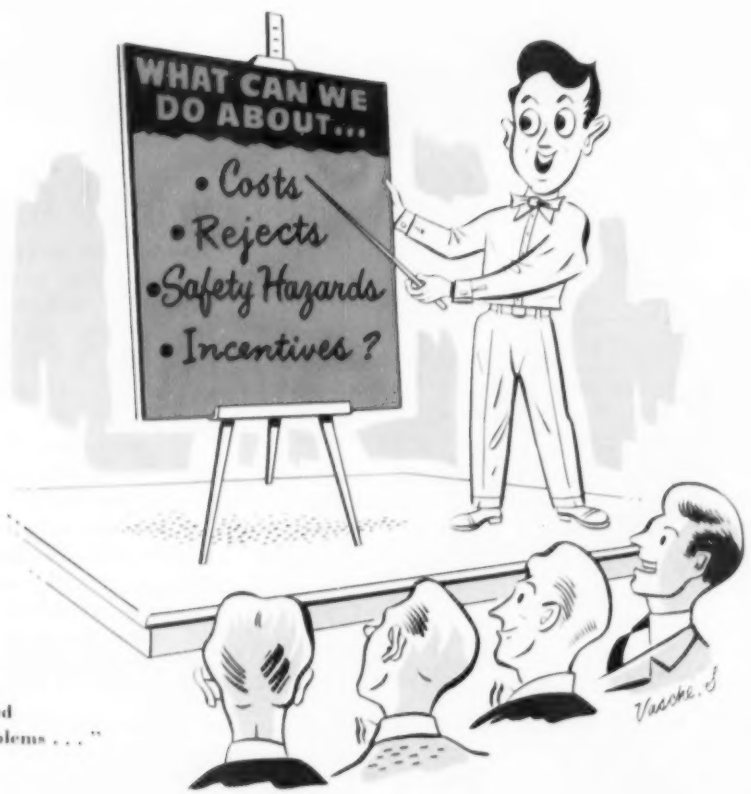
pedited by management-sponsored supervisory development programs.

A Successful Development Program

Such a program has been in operation at Package Machinery Co. for over five years. The program has five major goals:

- To increase the usefulness of supervisors to the company
- To consider supervisory problems constructively and to develop practical solutions for those problems
- To clarify and strengthen the positions of supervisors in the company
- To help the supervisors to help themselves by a free interchange of ideas and experience
- To supply each supervisor with as much information and training as possible, along lines that will keep him alert, up-to-date and effective in his position and qualify him for increased responsibilities.

All supervisors in the manufacturing division—department foreman, shift foreman, and assistant foreman—participate in the program. Supervisory development meetings are held once every two weeks, during working hours, and last for 90 minutes.



" . . . emphasis is placed on practical problems . . . "

Conference leaders are selected from participants in the program. Program coordination is furnished by the director of industrial relations. The training devices employed include conferences, lectures, panel discussions, case studies, guided tours, films and role-playing in which the participants "put themselves into the other fellow's shoes."

Two ground rules are observed: No one, other than conference members, can attend the conference except by direct invitation of the members themselves and the performance of individuals at conferences may not be discussed with anyone, including top management.

In the conferences, emphasis is placed on practical problems encountered by the participants in their daily work. Experience at other companies has shown that the "ivory tower" or theoretical approach does not generate the continued interest and enthusiasm which is essential to the learning process. Production supervisors, who are responsible for producing immediate practical results on their jobs, want immediate practical results from training sessions.

Starting the Program

The first supervisory development session was held in September 1951. Program goals, training methods and ground rules had already been established, but there was no predetermined list of subjects or course of study. Selection of discussion topics was left to the supervisors themselves, since it was felt that they were in the best position to plan topics dealing with their own problems.

At the first conference, participants listed twelve problems for discussion in future meetings. Solutions to these problems were developed at subsequent meetings and became a part of company policy. The areas covered, and action taken were:

ORGANIZATION: Functions, lines of authority and relationships of staff to line positions were discussed and the principle of a supervisor having only one boss—his immediate supervisor—was recognized as a firm policy.

COOPERATION: Practical ideas on cooperation, developed by the supervisors, were applied by the supervisors themselves, resulting in better cooperation at and between all levels of employment within the company.

NEW EMPLOYEES: The group determined the types of information to be given to new employees to get them off to the right start. A workable procedure was set up and carried out.

EMPLOYEE RATING: The performance rating system was improved upon and group members demonstrated effective methods of discussing ratings with employees.

INCENTIVE SYSTEM: Although all supervisors had completed the company time study course, many questions concerning the administration of incentives were asked at development sessions. Accordingly, the head of the standards division was invited to attend conferences as a guest speaker. More uniform administration of incentives resulted.

"Supervisors select their own problems for discussion . . ."

RESPONSIBILITIES OF SUPERVISORS

Employees

- Requisition new employees
- Interview prospective employees
- Indoctrinate new employees
- Train employees
- Recommend departmental transfers
- Handle grievances
- Reprimand employees
- Warn employees
- Recommend discharge
- Prepare performance ratings
- Discuss performance ratings with employees
- Grant limited leaves of absence
- Recommend extended leaves of absence
- Prepare vacation schedules
- Recommend promotion

Production

- Plan work
- Assign work
- Approve methods
- Maintain production standards
- Make salvage decisions
- Control waste
- Control departmental expenses
- Authorize overtime
- Recommend specification changes

Materials and Equipment

- Requisition materials
- Order tools, jigs, fixtures
- Maintain tools and equipment
- Order repair work
- Order new equipment

Company Policy

- Interpret policy
- Instruct employees as to rules and regulations
- Enforce rules

PREVENTING EYE INJURIES: A more effective eye-protection program was developed by supervisors. As a result, eye injuries were decreased by 74 percent from 1951 through 1955.

SELECTING THE RIGHT MAN: Characteristics to look for in an individual before recommending him for a supervisory position were agreed on by the group. A guide for selecting supervisors was developed. This guide, incidentally, was later reprinted in a book on selection of foremen, which was nationally distributed.

HANDLING GRIEVANCES: Grievance procedures, union contract clauses and other industrial relations matters were discussed and technical questions answered. A better understanding of those subjects help to promote improved employee relations.

PRODUCTION SCHEDULING: Planning functions were evaluated and a joint effort was made to eliminate difficulties caused by lost parts, incomplete information on route sheets and insufficient storage facilities. Materials handling by truck was also improved.

BLUEPRINTS: Representatives from the engineering, sales, standards and scheduling divisions met with the supervisory development group to talk about the problems involved when blueprints are altered or revised. As a result, all divisions acquired a better understanding of each other's problems in this area. Blueprints are now changed as seldom as possible.

FINANCIAL STATEMENT: Many supervisors reported that they did not fully understand the company's annual financial statement. The statement is now analyzed for the group by the company treasurer, who is a yearly guest speaker.

Since the inception of the program, many other subjects have been covered. These include:

- Departmental expense control
- Planning
- Industrial housekeeping
- Creating pride in workmanship
- Supervisor-employee communications
- Handling rejections
- Design, procurement and manufacture of castings
- Reduction-in-force procedures
- Injection molding
- Welding
- Basic hydraulics
- Industrial leadership
- Discipline and reprimands
- Civil defense.

The topics are selected on the basis of the current needs of the group. They can deal with any matter which is of direct or indirect concern to supervisors.

The findings and recommendations of the supervisors are communicated directly to company management through conference reports. Company officers and division heads, as well as technical specialists, frequently serve as guest speakers at the conferences. Thus the conferences have become an important channel of two-way communication between supervisors and management.

Solving a Specific Problem

Industrial supervisors have many responsibilities. One of the problems brought up at the meeting was the need for defining these responsibilities and for establishing the authority of each level of supervision to carry them out.

Further, most supervisors felt that while organization charts, position descriptions and the like served a useful purpose, the actual responsibility and authority exercised by individuals in comparable positions varied through the organization.

The assistant foreman of one department, for instance, spent nearly all of his time on short, routine assignments and had only a small degree of decision-making authority. The assistant foreman

of another department had many important responsibilities and commensurate authority to carry them out with a minimum of delays.

On paper, both foremen had the same degree of responsibility and authority; consequently, their salaries were identical. Both foremen had high abilities; however, the assistant foreman who had the heaviest actual responsibilities was better trained and better prepared for promotion than the assistant foreman who had only nominal responsibilities and authority.

With situations like this in mind, the supervisory development group made a thorough study of supervisory responsibilities and authorities. As a first step, a list showing all duties which were normally performed by supervisors was made up. This list was then reviewed by top management to make sure that it was as complete as possible.

The next step was to determine the degree of decision-making authority which should be assigned to each level of supervision to enable that level to carry out its responsibilities. Prior to conference discussion on this subject, a questionnaire was filled out by supervisors to see if there was general agreement as to the degree of authority which should be assigned to each level of supervision.

In the questionnaire, four kinds of degrees of authority were recognized:

- Full authority to perform the duty
- Authority to perform the duty, but must inform supervisor
- Authority to make recommendations only
- No authority.

Each supervisor rated three supervisory levels—department foreman, shift foreman and assistant foreman—on the basis of kind of authority required to perform assigned duties.

After the discussions, a final assignment of authority to each level of supervision was made. The authority of department foremen was slightly reduced, as compared with the original opinion of the supervisors, while the authority of shift foremen and assistant foremen was increased.

Another result of the discussions was the development of a list showing a number of supervisory duties, under the headings:

Responsibility for employees
Responsibility for production
Responsibility for materials and equipment
Responsibility for company policy.

These duties are shown in the accompanying table.

With the list of duties completed, specific responsibilities and authority for each level of supervision were worked out. This done, detailed procedures were outlined for carrying out each responsibility. The assignment of authorities and responsibilities was adopted as the operating policy of the company—a policy which is particularly effective because it was worked out by the supervisors themselves.

The supervisory development program has been highly successful, from the viewpoints of both top management and supervision. Improvements made by the discussion groups have been of value to employees, supervision and top management alike. The reports issued after each meeting have become a basic manual for foremen, who are now recognized as managers who know what they're doing. Further, participation in the program has enabled new foremen to learn from experienced supervisors and to make contributions of their own.

Success of the supervisory development program is due to four factors:

- Interest has been kept high by the discussion of everyday supervisory problems
- When solutions to these problems are worked out, positive action is taken to put the solutions into effect
- Ground rules established at the beginning of the program have been observed
- Top management has been sincere in backing the objectives and goals of the program.

These are the keys to success for any company which wishes to establish a sound—and successful—supervisory development program.

"No one can attend conferences without an invitation from participants . . ."

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Fixture for Milling Elongated Slots*

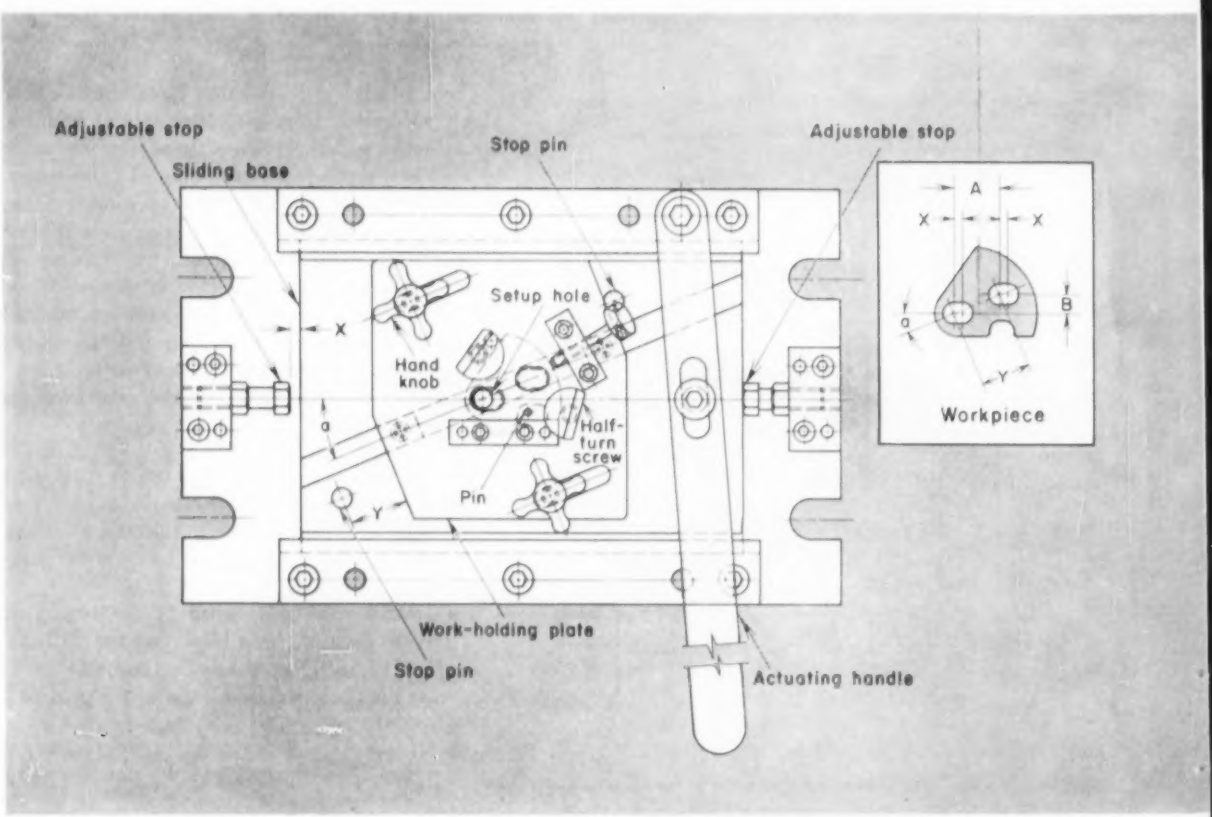
Production machining of two precision elongated slots by semiskilled operators is accomplished with the fixture illustrated. The fixture consists of a heavy fixed base which is fastened to the milling machine table; a sliding base actuated by a handle; and a work-holding plate. Length of cut is adjusted by turning two hex-head bolts in the fixture base. These bolts act as stops for the sliding element. The work-holding plate slides in a groove cut at an angle in the sliding base.

During setup, the fixture is positioned under the cutter by moving the machine table. A setup hole in the work-holding plate aids in aligning the fixture. The work-holding plate is locked in position against the stop pin on the sliding base by means of hand knobs. The casting is locked in place with two half-turn screws and a thumbscrew and the handle is actuated to mill the first slot. Then the cutter is removed from the slot and the two hand knobs are loosened so that the work-holding plate can be moved against the other stop pin. This diagonal movement "Y" along the keyway at angle θ, positions the casting under the cutter for cutting the second slot.

The fixture is particularly suited for high-production operations, since it makes it unnecessary for machine operators to watch dials or move the machine table in order to position the slots, and length of the slots is automatically controlled.

William E. Meyer
Rochester Chapter

*Gadgets Contest Entry



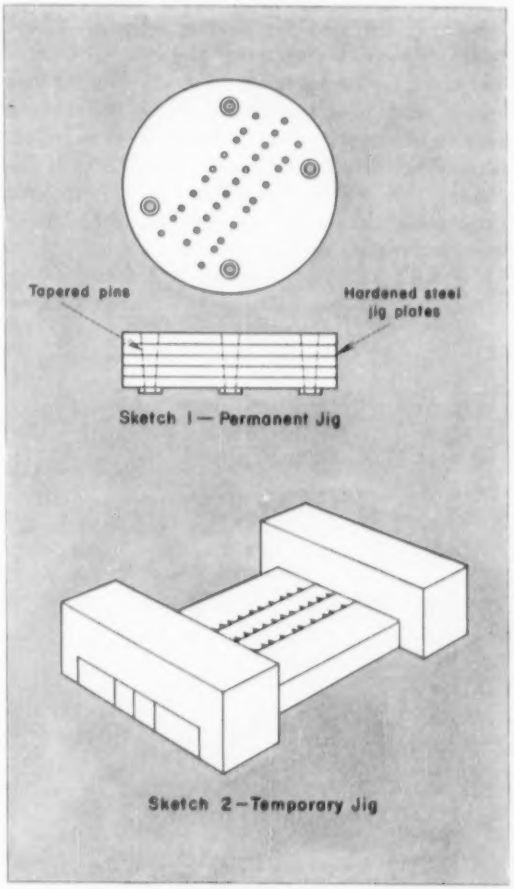
Drill Jig for Small Holes

Making accurate jigs for drilling large numbers of small holes is often a problem. When holes are drilled in the jig, the drill tends to wander. Heat treatment may cause distortion which impairs the accuracy of hole location.

This difficulty can be avoided by drilling holes in thin steel plates and assembling a sufficient number of these plates to form a jig of the required thickness, SKETCH 1. The plates can be held together by means of tapered pins, and this assembly can be inserted in a frame or case. Because of the thinness of the individual plates, wandering of the drill is no problem and heat-treated distortions can be minimized by individually hardening each plate.

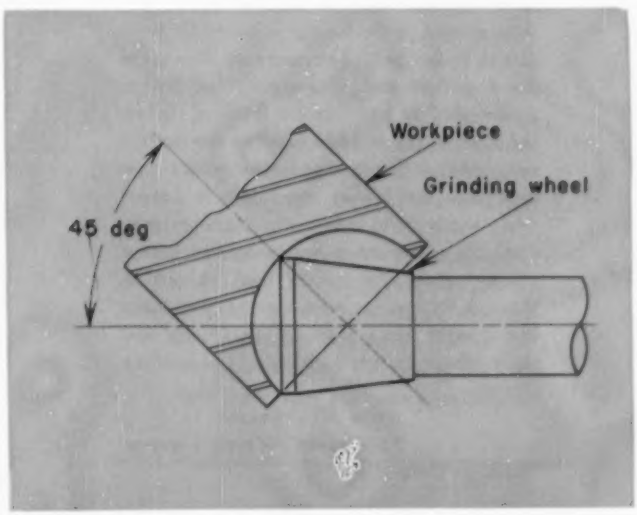
When holes are in line, a simple temporary jig can be made up to facilitate drilling holes in the plates which form the permanent production jig. In making the temporary jig, SKETCH 2, several square bars of soft steel are machined and ground to the required size. The edges of the bars are grooved in a milling machine. Spacing between the grooves is determined by the spacing of holes in the permanent jig. Depth of the grooves, which may be U-shaped or V-shaped, must be sufficient to accommodate a drill of the required size without binding. The blocks are assembled in a frame to form the completed temporary jig. This type of jig is easy to fabricate and highly accurate.

O. A. Olson
Des Moines Chapter



Sketch 1 — Permanent Jig

Sketch 2 — Temporary Jig



Grinding Spherical Ball Seats*

It is possible to generate a spherical ball seat, using an internal grinder and a straight wheel. The method illustrated was developed by Dan Jones, now retired, who was for many years toolroom foreman at the Cadillac Motor Car Div. of General Motors Corp.

Diameter of the wheel is determined by multiplying the ball seat diameter by 0.70711. It is necessary to taper the wheel slightly to allow clearance in the ball seat. To grind the spherical contour, the workpiece is mounted on a spindle and traversed over the grinding wheel as shown. Setup is simple and specially contoured wheels are not required.

H. D. Hiatt
Indianapolis Chapter

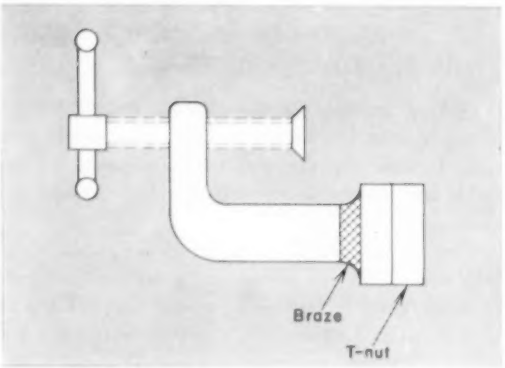
*Gadgets Contest Entry

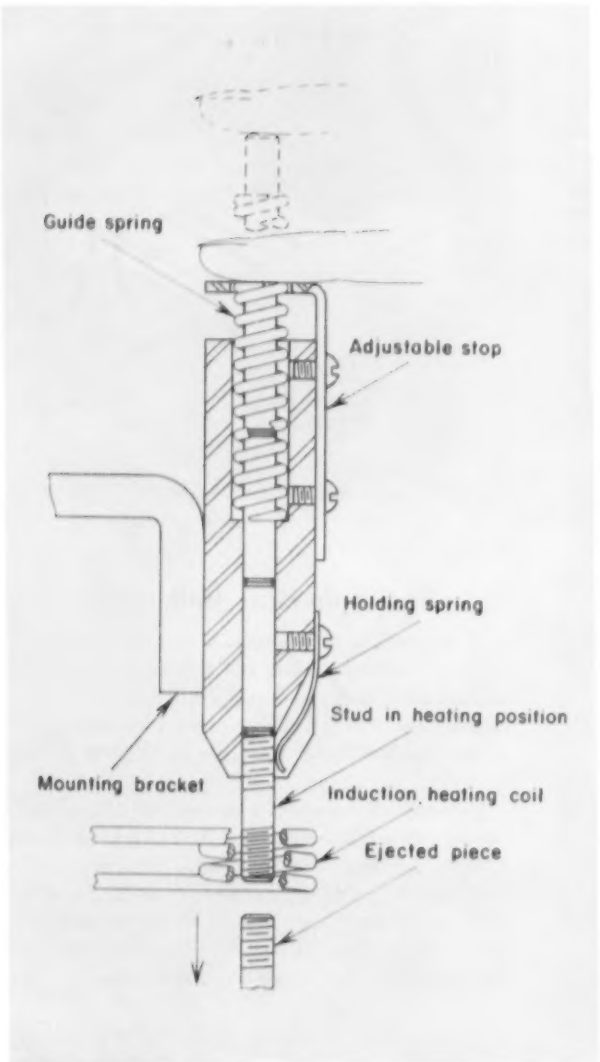
Gadgets

Clamp

Often, blocks and shims and special clamps of various types are used for holding work on rotary tables, planers, boring mills, face plates of lathes and milling machine tables. The clamp illustrated speeds setups and holds work firmly in place. It consists of a conventional C-clamp cut off as shown. A hardened T-nut is brazed to the body of the clamp. This can be inserted in T-slots in the machine table, eliminating the need for makeshift or special clamping devices.

J. Dodd
Detroit Chapter





Work Holder for Studs*

Induction hardening of one end of a stud was a slow and tedious operation. An operator gripped a stud with pliers, positioned it in the coil of an induction heater until the proper temperature was reached; lifted the stud clear of the coil and then dropped it into an oil bath for quenching.

The holder illustrated, designed to expedite heat treating operations, is mounted directly above the heating coil. A quenching tank is placed directly below the coil.

Components are fed into the holder through a guide spring. An adjustable stop is set so that when a stud is loaded, the bottom stud in the holder is correctly positioned in the coil. The operator then takes his finger off the guide spring and inserts a new stud in position for loading. When the stud in the coil has reached the correct temperature, the operator pushes the new stud into the holder, ejecting the heated stud, which falls into the quenching tank.

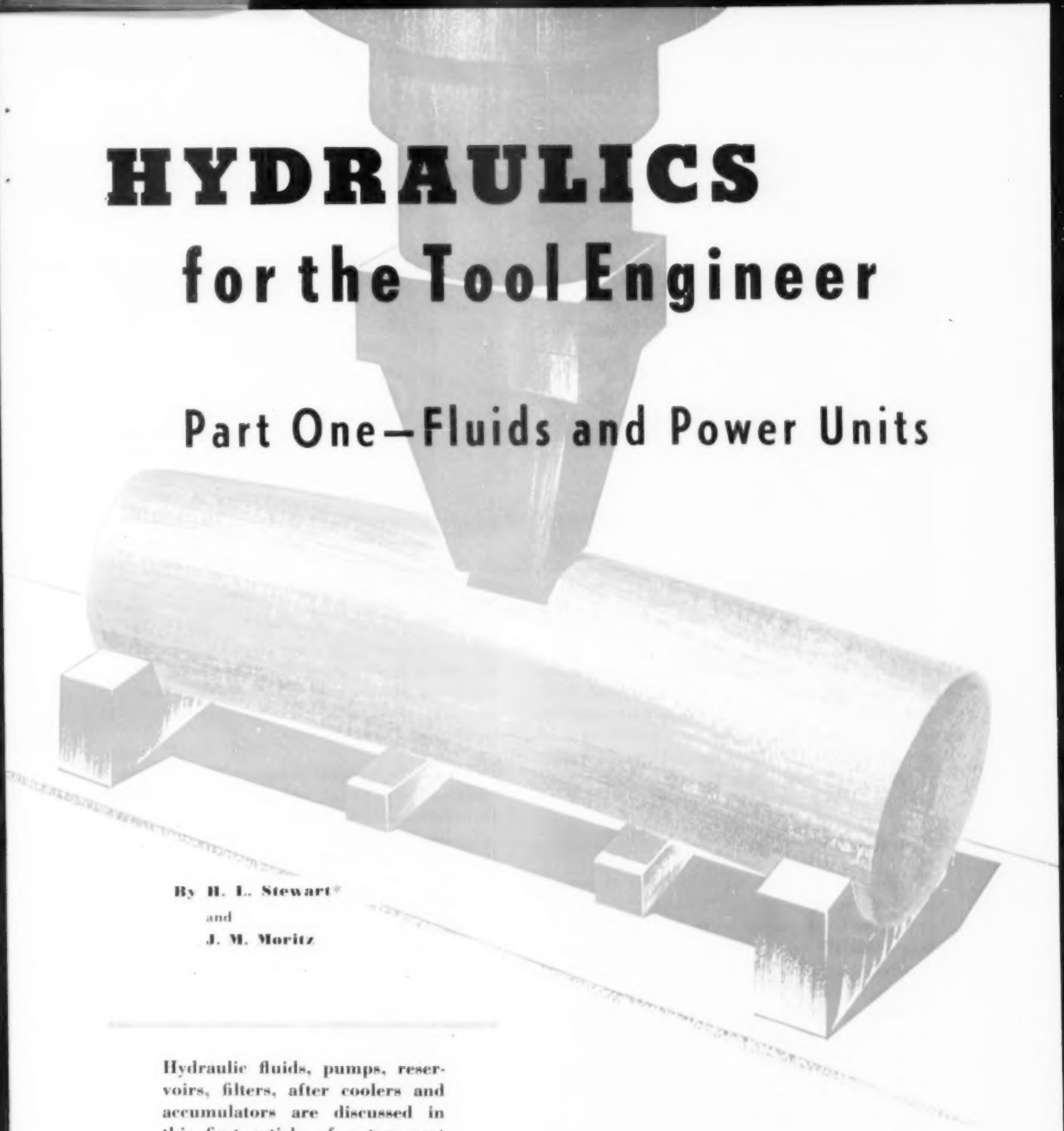
At the end of each run, untreated pieces remaining in the holder can be cycled through by loading a number of previously heat-treated parts into the holder. These studs can be released by lifting the holding spring.

Allen M. Johnson
Springfield (Mass.) Chapter

*Gadgets Contest Entry

HYDRAULICS for the Tool Engineer

Part One—Fluids and Power Units



By H. L. Stewart*
and
J. M. Moritz

Hydraulic fluids, pumps, reservoirs, filters, after coolers and accumulators are discussed in this first article of a two part series. Motors, cylinders, controls and circuit design will be covered in a subsequent article. Both articles are intended as an introduction to the fluid power field and are for nonspecialists.

WITH THE ADVENT of automatic machines and automated production lines, applications of hydraulic power in industry have increased manyfold. Continued improvements in component design and manufacturing methods have eliminated many of the maintenance problems associated with hydraulic power systems in the past. Today, hydraulic power is recognized as a reliable and versatile medium for actuating machinery and equipment. Indeed, where high power, simplicity, versatility and ease of con-

*Senior member ASTE South Bend chapter.

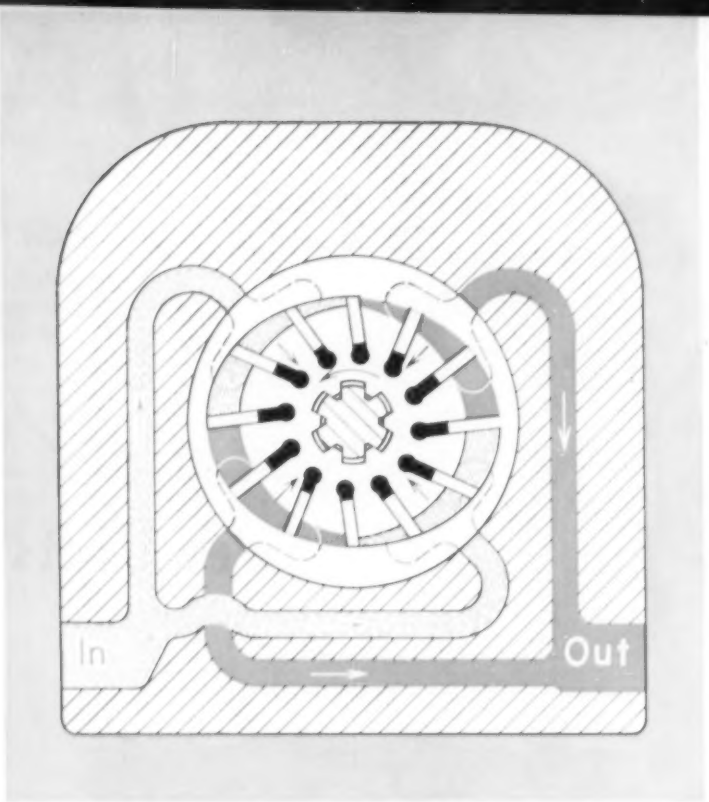


Fig. 1. Principle of operation of a Vickers single-vane type pump.

trol are required, hydraulic systems may provide the only feasible answer. In the machine tool field, hydraulic power units have found many applications. Hydraulic clamps provide a combination of strength and controlled pressure. The development of automation owes much to hydraulic clamping, positioning and actuating equipment.

Hydraulic Fluids

There are two basic types of fluids in general use: petroleum-base oils and "synthetic" fluids. The synthetics, which include water base and nonwater base fluids, are nonflammable. The characteristics required of a hydraulic fluid are resistance to emulsification, foaming and oxidation; stability of composition and viscosity; and good lubricating properties. In addition, fluids should not rust or corrode metals or attack nonmetallic materials used in hydraulic power systems.

Ideally, a fluid should have constant viscosity under all conditions of temperature and pressure encountered in service. Viscosity changes can cause internal leakage, pump and valve noises, and pressure losses. Resistance to foaming is of almost equal importance, since foaming allows air to be drawn into the pump, causing cavitation and excessive pump wear. For applications in areas where temperatures exceed the flash point of hydraulic oils, fire-resistant synthetic fluids are preferred.

Because equipment requirements and operating conditions vary, it is impossible to formulate any simple rules for the selection of hydraulic fluids for all types of applications. Recommendations of component manufacturers should be followed.

Hydraulic Pumps

Constant-displacement pumps produce a constant volume of oil at given speeds and pressure settings. In variable-displacement pumps, the volume of oil can be varied while speed and pressure remain constant. Commercially available pumps are capable of developing fluid pressures ranging from a few pounds per square inch to 10,000 psi or more. There is likewise a large range of pump sizes. Outputs range from one or two cubic inches per minute to over 50 gallons per minute. Some pump designs utilize gears or pistons; others employ vanes. A single-vane pump is shown in *Fig.* 1.

Pressure and volume requirements are, of course, two major factors in pump selection. The work cycle that will be required of the pump must also be considered. Inexpensive light pumps will often give satisfactory performance for light or intermittent duty applications. For continuous or heavy-duty

Pump Capacity versus Reservoir Capacity*

Pump Capacity (gpm)	Reservoir Capacity (gal)
0.5 — 1.5	6
1.6 — 10.0	30
10.1 — 13.0	40
13.1 — 30.0	70
31.0 — 50.0	120

*For systems operating at 1000 psi

applications, heavier pumps will be required. In general, piston type pumps are used for extremely high pressures. Pump failure can often be attributed to attempts to speed up a pump to attain greater volumes or pressures. For maximum pump life, the rated capacity of the pump should not be exceeded.

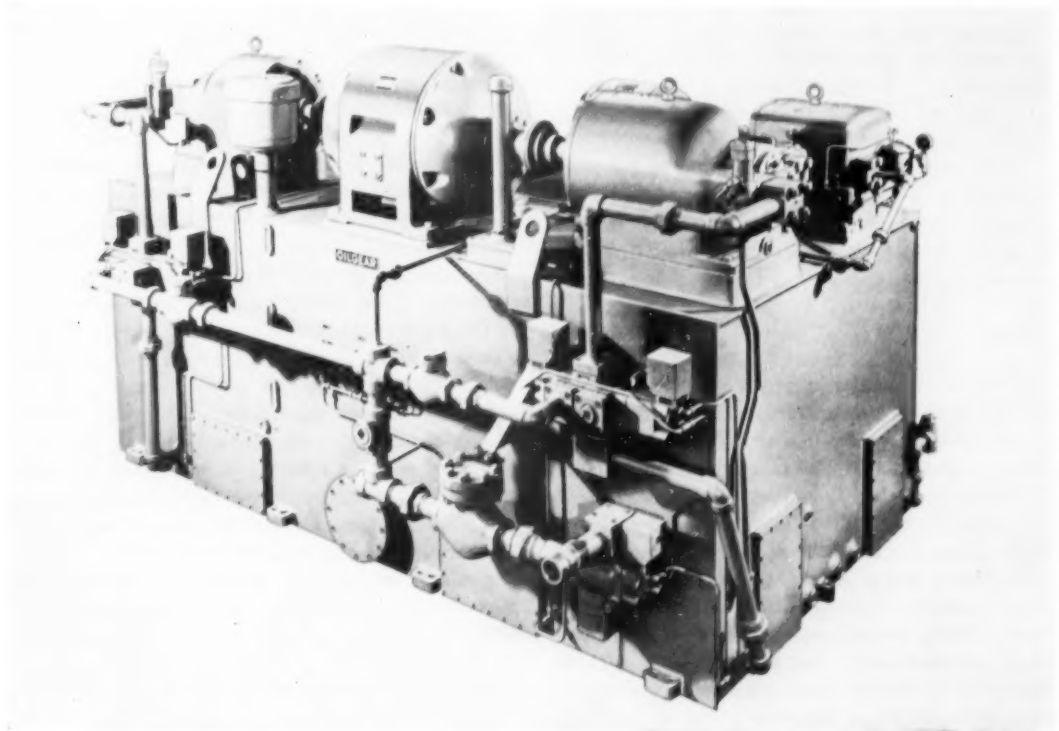
When it is desirable to use two speeds and operating pressures in the same system, it may be more economical to utilize two constant-volume pumps rather than one variable-volume pump. In hydraulic presses, for instance, the ram travels at a high rate of speed until the tool contacts the workpiece. A large volume of oil at low pressure is required for this portion of the stroke. After the tool contacts the workpiece, ram travel is slow. Only a small volume of oil is needed, but pressure requirements are high. Two constant-volume pumps—one for high volumes and low pressures and the other for low volumes and high pressures—will satisfy both requirements. Usually, the large-volume pump is controlled by a low-pressure unloading valve, and the small-volume pump is controlled by a high-pressure relief valve. When the workpiece is contacted, an automatic changeover valve changes the pressure to complete the work cycle. In one typical two-pump system, the high-volume pump delivers 100 gallons per minute at 100 psi and the other pump delivers 0.5 gallons per minute at 10,000 psi. Horsepower requirements for such a two-pump system are approximately two-thirds less than those for a comparable one-pump system. Further, since the amount of high-pressure oil passing through the relief valve is small, heating problems associated with the one-pump system are eliminated.

Reservoirs

Reservoirs have four functions: they serve as storage tanks for hydraulic fluid; they provide a place where the fluid can cool before being returned to the system; they act as settling tanks where dirt or other foreign material is deposited; and also act as a base for pumps and motors.

The operating temperature of hydraulic fluids should not exceed 140 F, so it is important that reservoirs be sufficiently large for adequate heat dissipation. Excessive heat will cause packing trouble, internal and external leaks, breakdown of hydraulic oil and malfunctioning of controls. Practical reservoir sizes for systems operating at pressures of 1000 psi are shown in the accompanying table. For maximum heat dissipation, there should be provision for a flow of air under the bottom of the reservoir.

The volume of oil required by the system also must be considered when determining reservoir sizes. The amount of oil contained in a large system may exceed the capacity of a standard reservoir. The reservoir capacity may be adequate when the



—Photo Courtesy Oil Gear, Inc.

Fig. 2. Compact hydraulic power unit with pump and motor mounted on reservoir. This unit operates an 1800-ton hot plate press. It has two constant-delivery pumps plus a two-way variable-delivery pump.

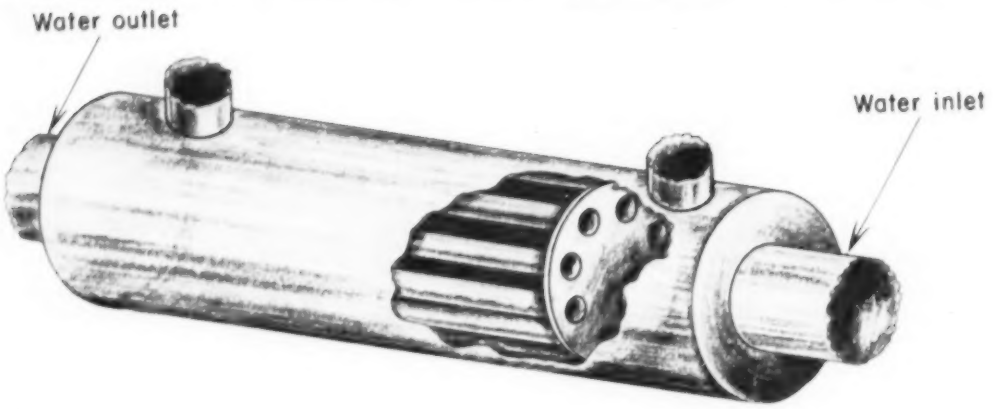


Fig. 3. Typical single-pass heat exchanger for cooling hydraulic oil.

system is in operation, but when the system is not operating, oil draining back into the reservoir may overflow.

Properly designed baffles in the reservoir break up the flow of oil returning from the system and facilitate the settling out of foreign particles. They also keep foaming at a minimum. The bottom of the reservoir should slope so that sediment will collect at one end of the unit. Cleanout openings are essential.

All reservoirs should be equipped with a cover to prevent air-borne foreign materials from contaminating the oil. To avoid creating a vacuum in the reservoir while oil is being pumped out, a breather must be provided.

If the motor and pump are mounted on the reservoir, *Fig.* 2, the mounting plate should be of heavy construction. To facilitate cleaning the reservoir, it is desirable to have the cover separate from the mounting plate.

Filters

Much of the sediment which accumulate in hydraulic fluids settles out in the reservoir. Filters mounted on the intake line of the pump give additional protection against damage or clogging caused by foreign particles. Complicated hydraulic systems also include other filters at various points. Fine-mesh screen is the most-used filter element.

Filters on pump intake lines should be located several inches above the bottom of the reservoir to avoid picking up sediment. They must, of course, be of sufficient size so that they do not restrict the flow of oil. If the flow of oil to a pump is insufficient, cavitation will cause excessive pump wear. Sump type filters are preferred, and they should be readily accessible for cleaning.

After-Coolers

If a hydraulic motor or cylinder operates in areas where ambient temperatures are high, or if oil at high pressures passes through the relief valve for long periods of time, oil may not be sufficiently cooled in the reservoir. In such cases, an after-cooler—some form of heat exchanger—will be necesary, *Fig.* 3. On occasion, operating temperatures may be so low that the oil in the reservoir must be warmed. Immersion type heaters are suitable for this purpose.

Accumulators

Hydraulic accumulators, used in conjunction with power units, provide a means for storing energy within hydraulic systems. This energy is released when needed. There are several basic types of accumulators, *Fig.* 4. These include diaphragm types, bladder types, spring types, piston types and dead-weight types. Hydropneumatic accumulators, in which energy is stored in the form of compressed air, are well adapted for use with small power units because of their compactness. They can often be mounted directly on the power unit.

Accumulators have a number of different functions in hydraulic systems. In systems where there is only momentary need for a large volume of oil, accumulators eliminate the need for a large pump and a correspondingly large driving motor. The accumulator can be filled by a small pump.

When pressures must be held for long periods of time, the accumulator functions as a leakage compensator, allowing the motor and pump to be stopped. In this case, the accumulator is used in conjunction with a pressure switch which stops and starts the electric motor to control the pressure. In

addition to functioning as a leakage compensator, the accumulator will reduce heating of hydraulic fluid, which otherwise passes through the relief valve when desired pressures are reached.

Accumulators are also used as surge chambers to take up the shock which results when a valve is closed suddenly. This reduces the possibility of damage to piping and other vital parts of the hydraulic system. Irrespective of the application, when accumulators are used, check valves must be provided to prevent oil from discharging back through the pump when the pump is stopped.

Drive Motors

Hydraulic pumps can, of course, be operated by compressed air motors or internal combustion engines. In most plants, however, there is adequate electrical power and electric motors are therefore an obvious choice.

It is important to select a motor which delivers the proper horsepower and speed to the pump. There is a tendency on the part of some engineers to select motors which are larger than is actually required, particularly if there is any doubt about the operating pressure requirements of the system. This results in a higher first cost and higher power costs as well.

Horsepower requirements can be determined by the formula:

$$\text{hp} = \frac{QP}{396{,}000E}$$

where Q is the pump output per revolution in cubic inches, P is the pressure in pounds per square inch, 396,000 is a constant and E is the pump efficiency, expressed as a percentage.

Motor speed is determined by the recommended operating speed of the pump. Pumps are rated for a given number of revolutions per minute and this speed should not be exceeded. Since high-speed motors have a higher power factor than motors of the same power rating which operate at lower speeds, motors selected to drive hydraulic pumps should be of the highest speed recommended for the pump. High-speed motors have the added advantages of lower initial cost and compact design.

In many hydraulic systems, unloading valves relieve the pressure until the machine cycle is started. Open-center, four-way valves also can be used to relieve pressure. This allows the motor to gain full running speed before a load is applied. Thus, starting torque is no problem. For most hydraulic systems, squirrel-cage motors of the Design "B" type are ideal.

A well-planned electrical circuit is just as important as a well-designed hydraulic circuit. The electrical circuit should include a safety switch with fuses, a magnetic contactor and a thermal overload relay. Joint Industry Conference (JIC) standards should be observed in specifying controls and enclosures.

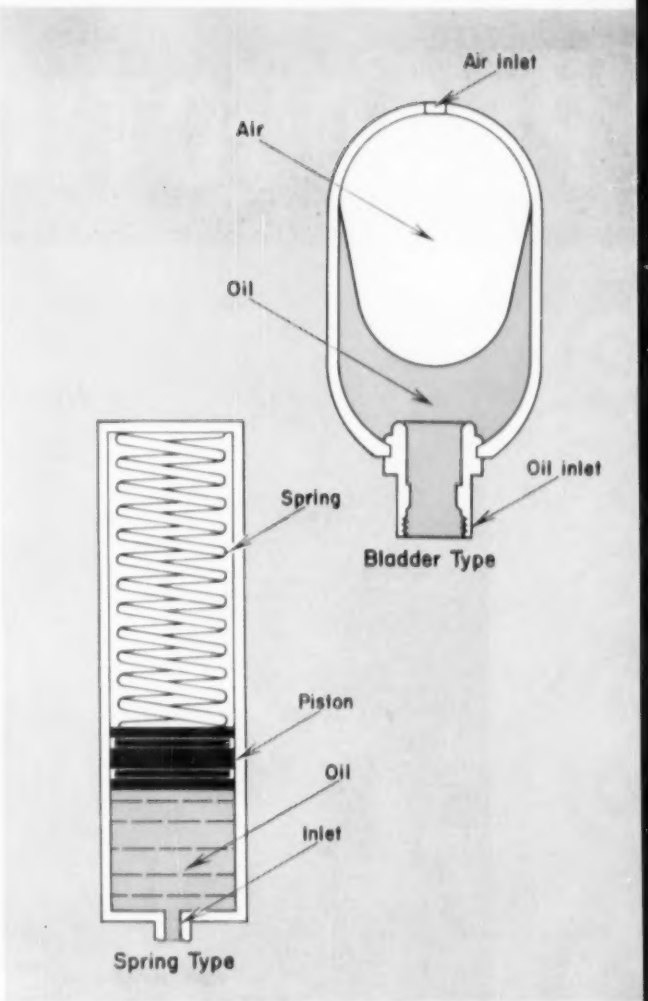


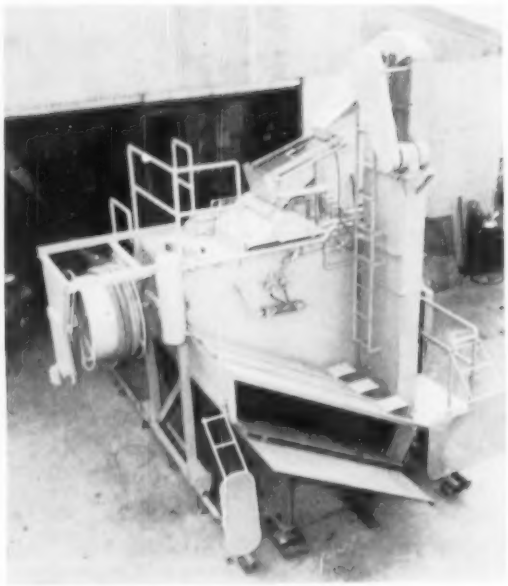
Fig. 4. Two types of accumulators. These store energy which is released when required by the system.

In the design of hydraulic power units, as with any piece of production equipment, accessibility for maintenance and ease of servicing are all-important. This rule applies not only to clean-out openings in reservoirs, filters and areas where lubricants are applied, but also to the power unit itself. If a unit is placed in an inaccessible location, for instance, routine servicing may be ignored. If, on the other hand, the unit is readily accessible, cleaning, lubrication and even replacement of major components are relatively simple. Accessibility for maintenance is the key to trouble-free operation and minimum down time. This is true, not only of power units, but of controls, hydraulic motors and cylinders, and all other circuit components. These will be discussed in the next article in the series.

designed for

PRODUCTION

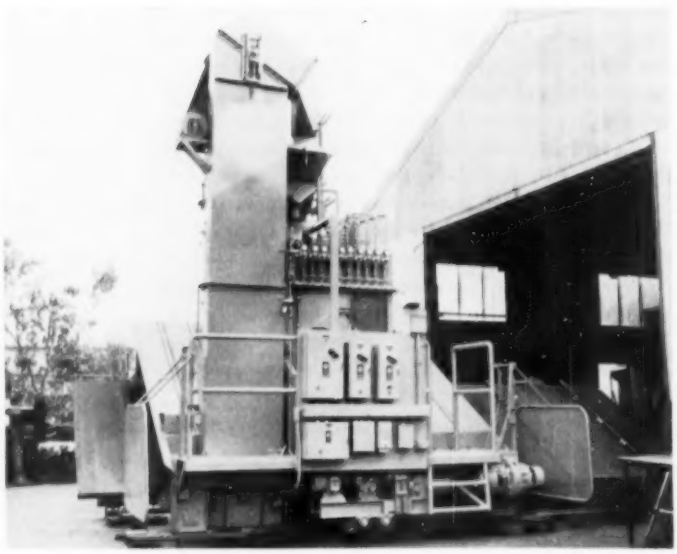
Machine Peen-Forms Wing Sections



PEEN-FORMING machine is connected to the compressed air source by a reel-mounted two-inch hose. Spent shot rolls down the slanted table and drops into a screw conveyor. This conveyor feeds a bucket elevator that raises the shot to the storage hopper via a vibrating screen and an air wash. Curtains at the carriage openings retain the shot without hindering operations.

Peen-forming machines provide a practical answer to forming problems associated with use of extrusion presses and skin mills in the manufacture of large, integrally stiffened panels for aircraft structures. Peen forming requires no dies and can be adjusted for the variations in initial curvature occurring from part-to-part after final machining. The method is applicable even when skin thickness is tapered or when plan form is irregular. Six variables can be adjusted to achieve desired part curvature: air pressure, shot size, shot feed, nozzle size, distance of nozzle from workpiece and time of exposure.

Peen forming on these machines, developed by Metal Improvement Equipment Co., results in beneficial residual compressive stresses on both surfaces of the panel. Because tensile stresses are not present, susceptibility of aluminum-alloy parts to stress corrosion and corrosion fatigue is greatly reduced.

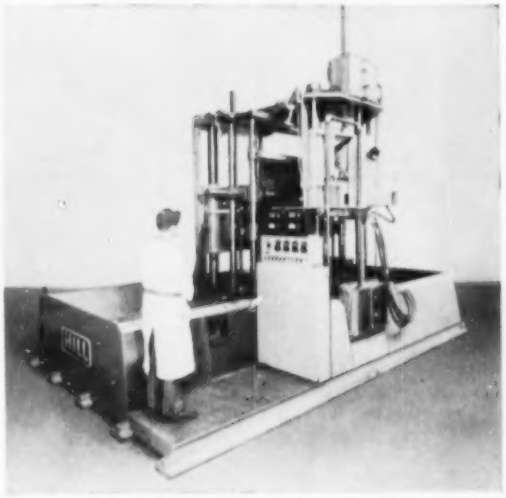


SELF-PROPELLED carriage is 12 feet long and travels on rails astride a 7 by 96-foot worktable. Carriage pulls itself along by a chain located adjacent to one of the rails. Drive motor is located under the electrical control panel. Controls for 10 shot-peening nozzles are located over the panel and are set for patterns.

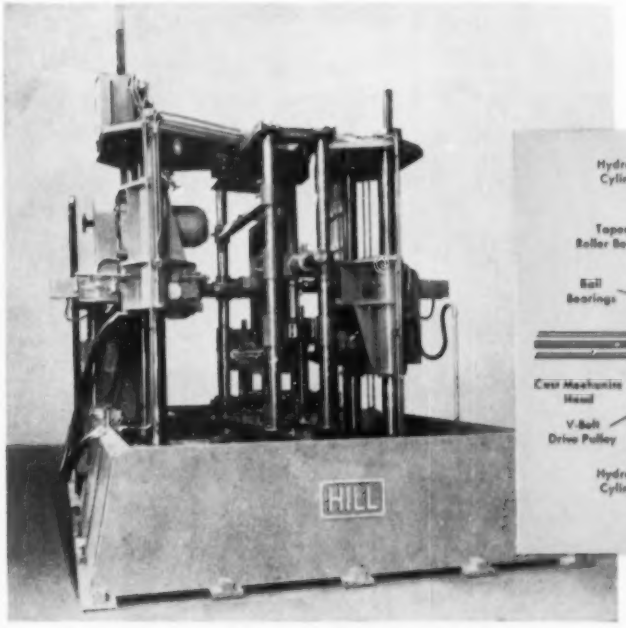
Opposed-Spindle Machine Drills Tube Sheets Quickly

This machine was designed to reduce the time required to drill condenser tube sheets and baffles. A tube sheet—6 feet in diameter, 5 inches thick, requiring 2400 ¾-inch holes—formerly required about 160 hours to produce. This included layout, center punching, spotting with a center drill, drilling and reaming. With this machine, developed by Walter P. Hill, Inc., layout is accomplished by controlling workpiece and drillhead locations, and drilling accuracy is such that reaming is unnecessary. Total production time for a similar tube sheet is 8 hours.

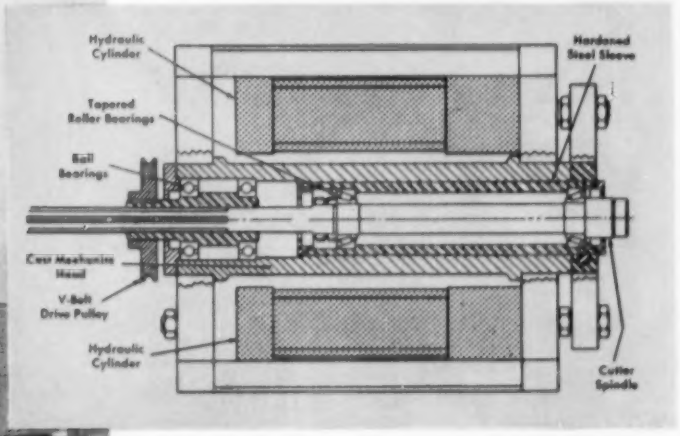
Drill feeds up to 18 ipm have been achieved with conventional oil flute drills. Gun drills can be used where smoother holes to closer tolerances are necessary. Load meters on the panel indicate drill condition. Drills are automatically backed out if hard spots or dulling cause overloads above preset values.



AUTOMATIC opposed-spindle drilling machine drills two holes at a time in different rows of a tube-sheet pattern. One head drills the upper half while the other head drills the lower half of a symmetrical hole pattern. Drill heads are indexed up and down, and the workpiece table is indexed sideways to complete the pattern of holes.

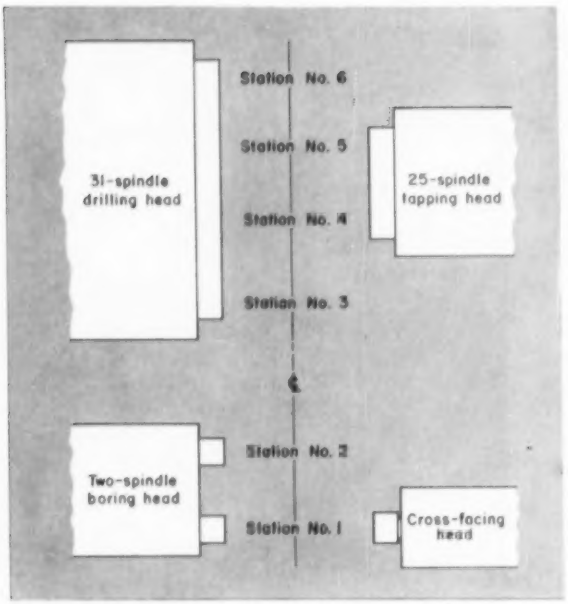


VERTICAL and horizontal indexes are controlled by individual escapement wheels that are moved by shaved gears driven by racks and pinions. Hole spacings for different designs are obtained through insertion of suitable change gears between the shaft and the escapement wheel. Drill heads move on 6-inch-diameter columns and the table slides on hard ways.



POWER HEADS are designed so stability increases as the spindles are extended during drilling. Spindles are supported in a long steel sleeve by tapered roller bearings. The sleeve is ground to fit the honed, cast Meehanite head. Hydraulic cylinders at each side of the head control spindle feed and the spindle is rotated through a V-belt by a motor mounted on top of the head. The end of the spindle is splined and slides through the drive-pulley shaft as the drill advances and retracts.

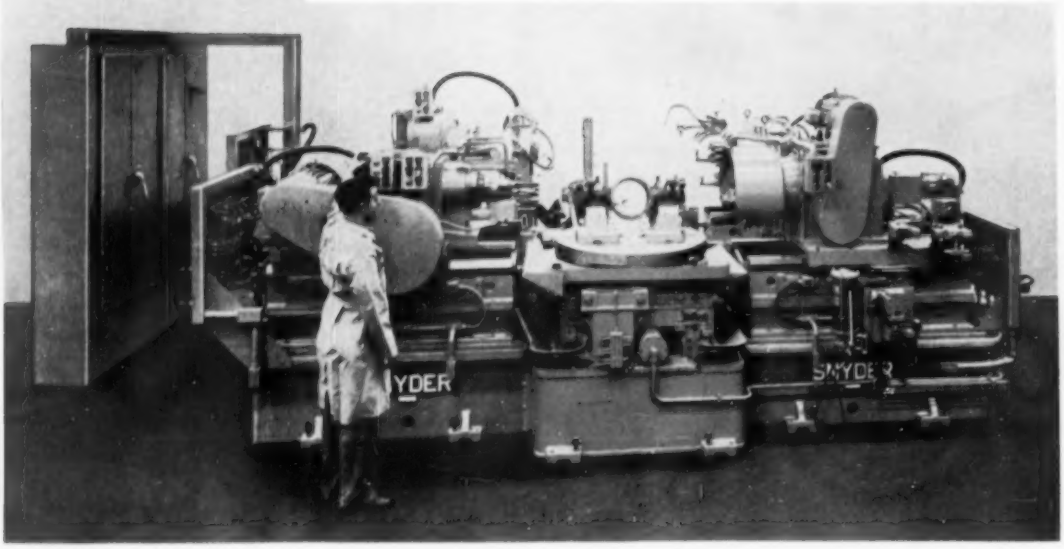
Partial Automation for Small Runs



Hydraulically operated and electrically controlled, this machine shows the extent to which partial automation concepts can be applied on limited-production special machines. This unit machines three different types of tractor axle housing of cast steel or malleable iron. Production rates for the three housings are only 8.5, 9.1 and 10.2 parts per day. There are 28 tool changes required during the machining cycle.

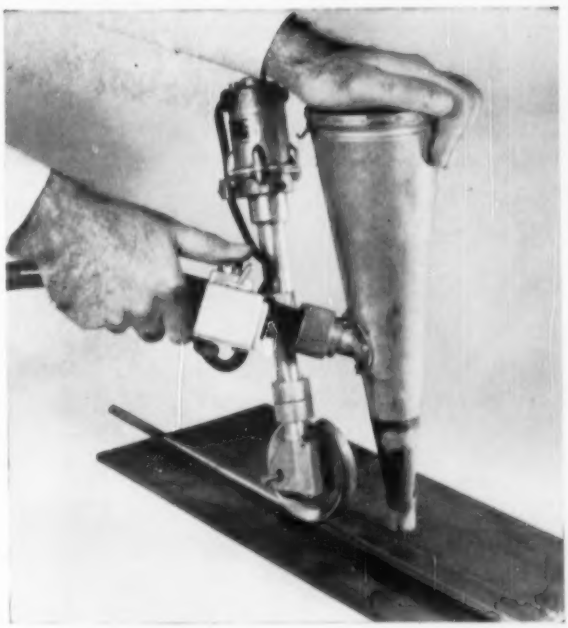
MACHINING OPERATIONS are accomplished via pushbutton controls that index the fixture back and forth between stations, rotate the fixture and feed the machining heads. Quick-change adapters in certain spindles permit rapid tool changes.

SPECIAL MACHINE performs up to 40 drilling, boring, turning and tapping operations on large tractor-drive axle housings. Operating flexibility is achieved by mounting the part on a table that can be indexed—in-line through six stations or around through 180 deg. Each of the four heads is mounted on an individual slide unit.



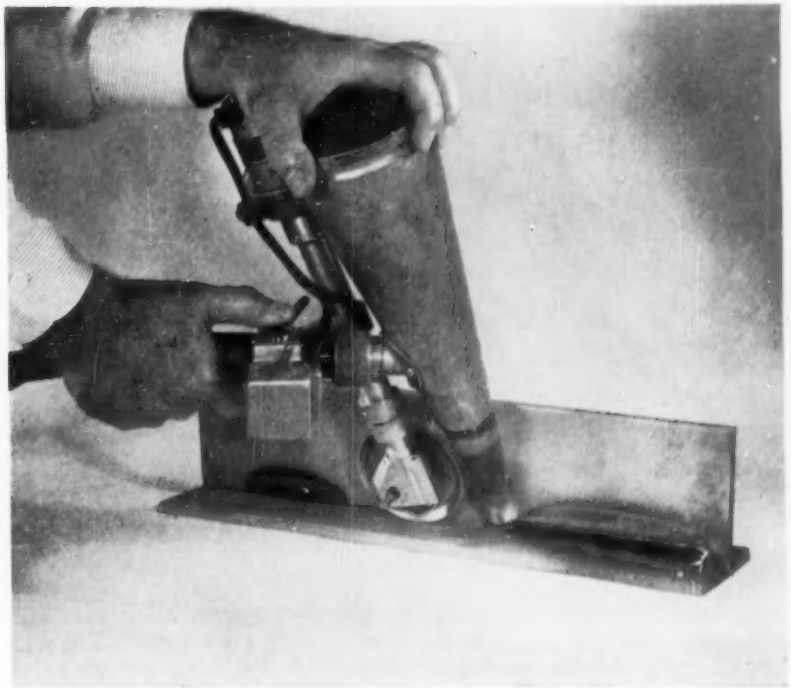
SUBMERGED-ARC WELDING Speeded by Pacer

Semiautomatic submerged-arc welding has been limited to ¼-inch and heavier plate but tests of an electrically driven pacer have shown the process can be used on material as thin as ⅛ inch. The pacer, developed by Carlson Mfg. Co., operates at welding speeds between 8 and 80 ipm and produces smooth, uniform welds. High-quality welds can be produced without high operator skill, and this tool permits a certain amount of mechanization of the process.



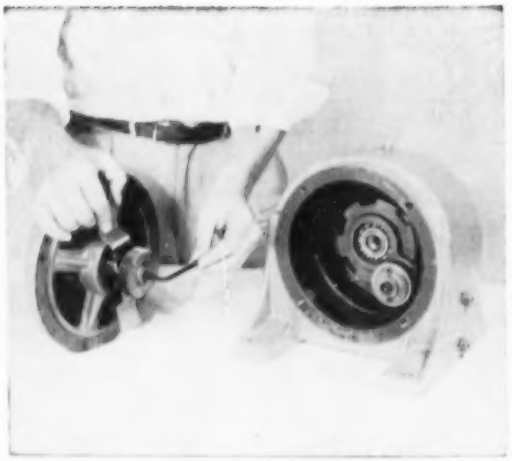
DOUBLE-BEVEL wheel rides tack-welded or clamped guide bar to produce straight weld bead. Welding speed on ¼-inch plate, with copper backup, is 15 ipm. On ⅛-inch sheet, speed is 30 ipm without backup or 60 ipm with backup; all welds at 100 percent penetration. Lack of visibility is no problem.

—Photos courtesy Westinghouse Electric Corp.



FILLET WELDS can be made easily through use of the double-bevel drive wheel. Single-bevel wheels can be used for lap-fillet and similar welds. Equipment consists of a small d-c motor mounted on a telescoping drive shaft that is adjustable to work level. It is clamped to a standard welder cable and can. Buttons and switches permit starting, inching and reversing of the unit. For this picture, the granular flux has been omitted.

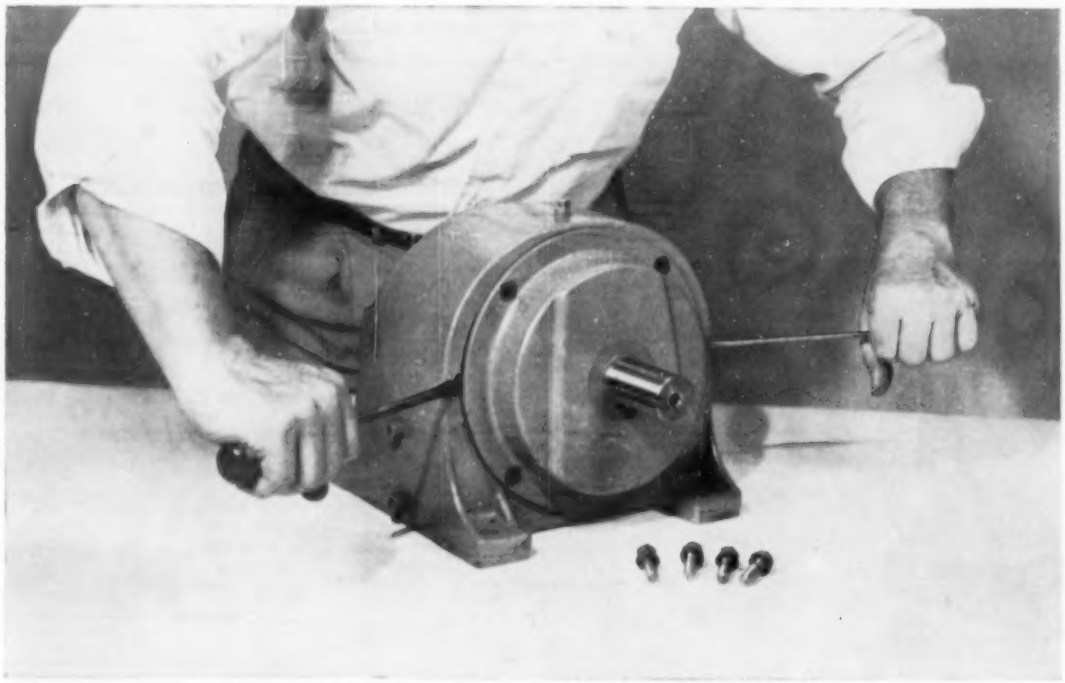
Gearmotors Designed for Ease of Maintenance



HIGH-SPEED PINION can be jacked out of its shaft with the same bolt that locks it to the shaft. The first-stage gear is secured firmly against axial movement in operation by a bolt, lockwasher and captive keeper plate assembly. For disassembly, two small bolts are inserted in two tapped holes in the gear hub. The gear is then pulled off the shaft by turning the main bolt out of the shaft.

This line of gearmotors has been developed for flexibility in both installation and maintenance. Ratio changes are easily accomplished by changing just the first-stage gear and pinion. Changes in requirements do not require a large inventory of complete units. These changes can be made easily in the field with standard hand tools, and it is not necessary to disconnect the unit from its driven load.

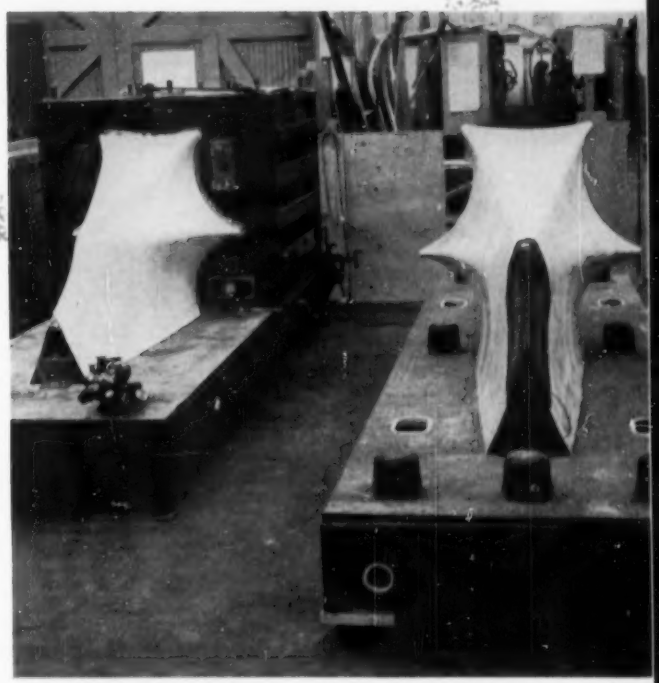
Further reduction in spare parts inventory is realized with this line of gearmotors, developed by the General Electric Co., by standardizing parts within the line. Five double-reduction and seven triple-reduction units cover a range of outputs that previously required 36 sizes. Fixed low-speed ratios reduce the number of different gear parts that must be stocked for large installations of these units.



RECESSED LUGS in the output cover make it possible to remove the cover with two screwdrivers. Only four bolts need to be removed.

Putting Honeycomb Scrap to work

By Jack Lewis
Associate Research Engineer
Boeing Airplane Co.
Seattle, Wash.



This completed plastic tool is used as a master gage to check the actual section of the airplane. A complete series of small tools, from trim jigs to drill fixtures, are all coordinated to this master tool.

BY USING A MACHINE marked for replacement and scrap material, Boeing Airplane Company has substantially reduced over-all manufacturing costs in the building of aircraft tools. The machine was a three-ton press and the material, leftover pieces of aluminum honeycomb. Normally, when enough waste honeycomb was collected, it was crushed into bales and sold for scrap metal. However, through the cooperation of manufacturing research and the plastic shop, a new technique was developed to salvage this honeycomb. So successful was the program that today not a square inch of the "waste" is wasted.

Small pieces of honeycomb are laid on the bed of the press with their edges overlapping. Then the ram is brought down. No bonding agent of any sort is required. Overlapping cells become interlocked, under pressure of the ram, to form permanent bonds which have the look and strength of welded joints.

The ram of the press doesn't utilize a stop, as the operator can tell by "feel" when the honeycomb has been flattened to an even thickness. Oddly enough, the crushing of the longer cells has little or no effect on the physical properties of the honeycomb panel as a whole. This was proved by exhaustive testing.

Progressively larger and larger sections of the salvaged honeycomb are joined together until a panel, some four feet wide by six feet long, has been formed. The formed panel is then treated as though it were a panel of new honeycomb.

Fiberglass sheets, impregnated with an epoxy resin, are used to cover the top and bottom. This is followed by a curing period of from six to eight hours.

The resulting sandwich panel compares favorably, in all respects, with one made from new core stock. It may be sawed into stiffeners, base plates, gussets and other structural parts. At Boeing, honeycomb paneling has largely replaced solid plastic laminates with a substantial monetary saving.

Another cost-reducing factor is the light weight of the honeycomb paneling. It may take two men

After all sandwich panels are bonded into place, they are wrapped with additional layers of fiberglass and resin to protect and strengthen the assembly.

to raise a large panel of solid plastic, where a honeycomb panel of the same size could be lifted with one hand.

Half-inch aluminum honeycomb, in its virgin state, weighs four ounces per square foot. When the fiberglass sheets are affixed, the material is 5/8 inch thick and weighs 1.5 pounds. These structures then have a weight advantage ratio of one to six, or better, over the same panels of traditional materials.

A good example is the master model of the B-52 pod. In steel, the model would weigh about 28,000 pounds. Its plastic and honeycomb counterpart, now being used, weighs only 2000 pounds. Also consider the KC-135 cab master model. Originally constructed of plaster, aluminum and steel, it weighed 20,000 pounds. Not long ago it was replaced by a plastic tool weighing under 2500 pounds.

Model life of the new plastic tools is another important consideration. Where plaster expands or cracks, not being resistant to temperature changes, plastic is durable and strong. Where aluminum and steel corrode, plastic remains unaffected by such things as heat, acid, oil, water or grease. Moreover, plastic tools have excellent dimensional stability. Properly designed, the tools will keep this stability even after rough treatment in transportation or use.

Aluminum or steel weldments are being replaced, in jig building, by plastic primary structures. This is also true on huge, floor-mounted drill plates. They are now made from laminated plastic with only the bushings and locating pins made of steel.

New plastic gages are in the design stage at Boeing. These gages will be employed to check the intake duct section, window openings and galley doors. However, not all tools can at present be changed over from metal to plastic. Certain tools require the full mechanical properties of metal.

Plastic tools reinforced with honeycomb are strong, comparatively cheap to make and easy to handle. Every day manufacturing research is devising new methods to tackle old problems. Better products at lower costs result from this effort.

Research Raises Impact Strength of Cermets

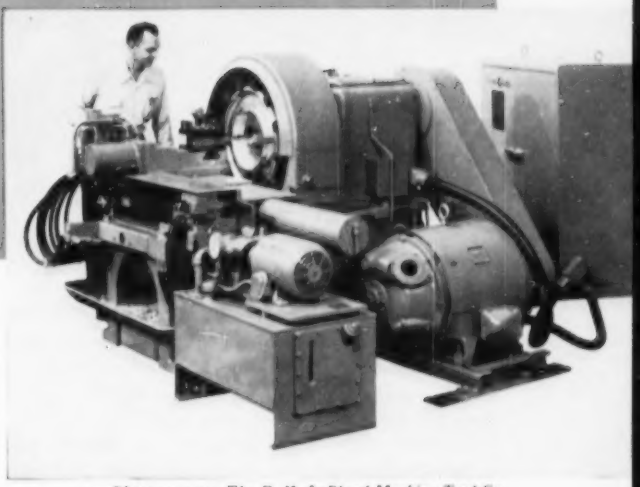
DUCTILE METAL COATINGS applied to cermets have been reported to improve their impact resistance appreciably. Work with K161B base cermets, for use in gas turbines has been under research by an Air Force contractor. Research was initiated because of the assumption that impact failures originate in surface brittle cracks formed under tensile stresses. It was agreed that formation of an integral surface, which was more metallic than the cermet body, would be less prone to originate brittle fracture; consequently, impact resistance would be improved.

Application of 0.018 inch of electrodeposited nickel, bonded by suitable vacuum heat treatment, raised the cermet's impact strength from 2.65 and 3.36 in-lb at room temperature and 1800 F respectively to values of 21.48 and 18.96 in-lb at the same temperatures. Diffusion bonding of shaped tubing also appeared to raise impact strength appreciably.

Infiltration of porous sintered coating produced structures which seemed promising; however, there was no essential change in impact strength. Direct application of brazing alloys proved unsatisfactory. Vacuum cast coatings have microstructures which invited further research, but were not evaluated.

facing at constant cutting speed saves time

By Max Kronenberg*
Consultant
Cincinnati, Ohio



—Photo courtesy The R. K. LeBlond Machine Tool Co.

Fig. 1. Facing of turbine wheels represents a good production application of constant cutting speed.

A simple mathematical analysis shows the savings that can be realized by face turning at constant cutting speed rather than constant rotational speed of workpiece.

IT IS OBVIOUS that cutting time can be saved in face-turning operations if constant cutting speed is used instead of constant rotating speed. It is not so obvious what the theoretical limits are to these savings or how closely the limits can be approached on production operations, *Fig.* 1.

A lathe-tool point describes an Archimedean spiral, *Fig.* 2, when facing a workpiece. Other types of spirals do not reach the center so their formulas cannot be used to investigate cutting time. Correct relationships can be established for face turning by using the basic formula for an Archimedean spiral.

Theoretical Considerations: The length of the path of an Archimedean spiral can be computed from:

$$L = \pi f z^2 \quad \ldots\ldots (1)$$

where

L = length of path for z turns and going all the way to the center, inches

f = feed per revolution, inch

z = number of turns in spiral

It can be seen in Equation 1 that the length of a spiral is related to the square of the number of turns.

For the facing operations, the number of turns in the path of the tool, from the outside diameter, D, to the center, can be determined by dividing the feed rate into the workpiece radius:

$$z = \frac{D}{2f} \quad \ldots\ldots (2)$$

By substituting Equation 2 into Equation 1, the total length of the spiral is found to be:

$$L = \frac{\pi D^2}{4f} \quad \ldots\ldots (3)$$

To find the time, T_v, required for facing a workpiece at constant cutting speed, v, it is only necessary to divide the path length by the cutting speed, changing the cutting speed units from feet to inches

*Senior member ASTE Cincinnati chapter.

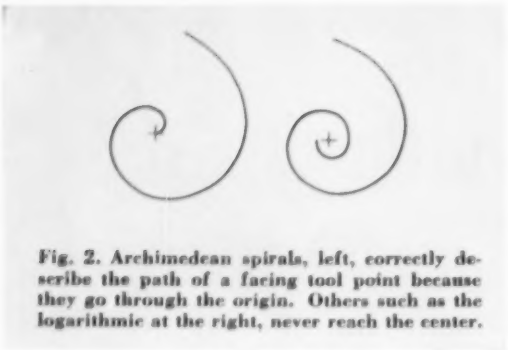


Fig. 2. Archimedean spirals, left, correctly describe the path of a facing tool point because they go through the origin. Others such as the logarithmic at the right, never reach the center.

per minute:

$$T_c = \frac{L}{12v} = \frac{\pi D^2}{48fv} \quad \ldots\ldots (4)$$

Cutting speed is found from:

$$v = \frac{\pi D n_a}{12} \quad \ldots\ldots (5)$$

where n_a is the initial spindle speed in revolutions per minute for the outside diameter dimension.

By substituting Equation 5 into Equation 4, a simple equation is obtained for the machining time required for facing at constant cutting speed:

$$T_c = \frac{D}{4fn_a} \quad \ldots\ldots (6)$$

On the other hand, the machining time, T_a, for facing at constant rotational speed is obtained in the usual manner, dividing the radius by the feed per minute:

$$T_a = \frac{D}{2fn_a} \quad \ldots\ldots (7)$$

By comparing Equations 6 and 7, the theoretical limit of savings that could be realized by facing at constant cutting speed is seen to be 50 percent. It would take only half as long to make such a cut as it would for one at constant rotating speed. This theoretical limit cannot be bettered and practical considerations prevent its achievement.

For constant cutting speed, the rotating speed of the spindle would have to increase continuously as the working diameter decreases. At the center, an infinite speed would be needed.

Practical Limits: In actual practice, the spindle speed can increase only to a certain maximum value. It would have to stay at that value for the remainder of the cut. To accurately estimate possible savings by constant cutting speed, only a ring section of the workpiece can be considered.

If d represents the workpiece diameter at the point where spindle speed ceases to increase, it is possible to develop a formula for cutting time for a ring being faced at constant cutting speed. By following the same steps as for Equation 6, it is found that:

$$T_c = \frac{D^2 - d^2}{4fDn_a} \quad \ldots\ldots (8)$$

The corresponding time for facing a ring at constant rotational speed is:

$$T_a = \frac{D - d}{2fn_a} \quad \ldots\ldots (9)$$

The savings in percent, S, in the machining time obtained when facing a ring from diameter D to diameter d at constant cutting speed, when compared with facing at constant spindle speed, is obtained by combining Equations 8 and 9, or:

$$S = \frac{T_a - T_c}{T_a} 100 = 50 \left(1 - \frac{d}{D}\right) \quad \ldots\ldots (10)$$

Equation 10 is graphically illustrated as the lower curve in *Fig.* 3.

With reference to the curve, several conclusions can be drawn. If a variable-speed drive (the spindle speed can be varied to keep the cutting speed constant) has a ratio of lowest-to-highest spindle speeds of 1:2, rings can be faced at constant cutting speed with a 25 percent saving in time. This is equivalent to saying that the saving would be 25 percent in any instance where the smallest diameter of the ring is half the outside diameter.

If the variable-speed drive has a ratio of 1:3, expected savings increase to 33.3 percent. At a ratio of 1:6, the savings are 41.6 percent. Further increases in the range of variable-speed drives do not substantially increase the savings. Possible savings approach a maximum of 50 percent when the top speed of the drive is infinitely greater than the slow speed. The largest ratio currently is 1:16, for which the anticipated savings are 47.3 percent.

Shifting Gears: These savings are only possible when comparing constant cutting speed with constant rotating speed at its simplest. Anticipated savings would not be as large if drive gears were shifted periodically on the constant rotating speed machine. The extent to which the comparative savings would be decreased would depend on the frequency of shifting and the time require for cutting.

The effects of gear shifting can also be investigated mathematically. For each gear shift, there is a ring faced at constant spindle speed. If g is the ratio between speeds in the headstock (geometrical progression), v_a is the mean cutting speed for the ring and m is a factor indicating the frequency of gear shifting, machining time can be found from:

$$T = \frac{(D^2 - d^2) g^m \pi}{24fv_a(1 + g^m)} \quad \ldots\ldots (11)$$

The factor, m, equals unity when the gears are shifted each time time the lowest cutting speed is reached. It equals two if every other gear change is skipped. If m equals zero, a variable-speed drive

is indicated and Equation 11 becomes identical to Equation 8 after substitution of the cutting speed. When facing materials, such as titanium, that would be marked by stopping the cut, gears would not be shifted and the full anticipated savings would be possible through constant cutting speed.

Facing Tests: A short test program was run to see if actual conditions would match calculated predictions. A test log was faced from an outside diameter of 18.7 inches to a diameter of 6.2 inches. Feed was held constant at 0.0244 ipr. During the first test, cutting speed was held constant at 71.5 fpm, equivalent to a spindle speed variation from 12 to 36 rpm. Machining time was 14 minutes, which compared closely with the computed time of 14.2 minutes. The slight difference resulted from a stopping error.

Using the same conditions, but with a constant spindle speed of 12 rpm, the next machining time was measured at 21.4 minutes, exactly equal to the computed time. If this operation is done at constant cutting speed, the time saving is 33 percent. This checks with the savings anticipated for a 1:3 ratio machine. A second series of tests on the same workpiece, but at constant speeds of 575 fpm and 118 rpm, gave equivalent results.

With a slightly different machine but the same workpiece, a test was run using the technique of gear shifting. Test log speed was changed each time initial cutting speed could be obtained again with the next higher spindle speed. Initial speed was 12 rpm and, in five steps, the final speed was 38 rpm. The workpiece was faced to a slightly smaller diameter, 5.5 inches, in 16.88 minutes, including stops. This indicates more than a 21 percent saving over a constant-spindle-speed operation at 12 rpm.

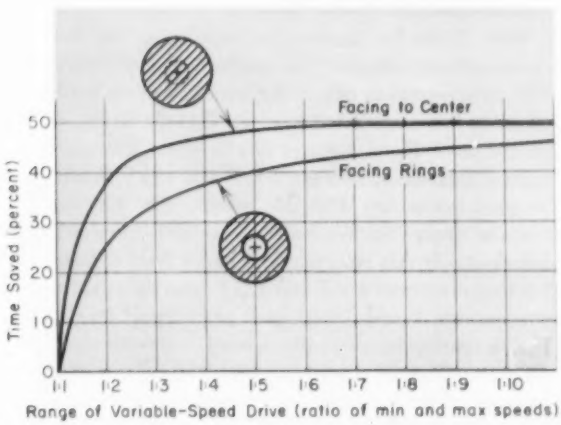


Fig. 3. These curves show facing time that can be saved by constant-cutting-speed methods over constant spindle-speed techniques. The lower curve represents conditions during facing of rings; the top curve shows results when the cut must be finished, from the dashed line to the center in the sketch, at the highest permissible speed of the machine.

Production Facing: Where a workpiece must be faced to the center, the best operation is to cut at constant cutting speed to as small a diameter as possible and then finish the cut at constant spindle speed. Machining time from D to d has already been found in Equation 8. Machining time, T_m, from d to the center, at constant spindle speed, is:

$$T_m = \frac{d}{2fn_b} \quad \ldots\ldots (12)$$

where n_b is the spindle speed from d to the center. The value of n_b can be computed from the condition of constant cutting speed between D and d:

$$\frac{\pi d n_b}{12} = \frac{\pi D n_a}{12}$$

$$n_b = \frac{D n_a}{d} \quad \ldots\ldots (13)$$

Substituting Equation 13 into Equation 12, and adding Equations 8 and 12, yields the total facing time:

$$T_t = \frac{D^2 + d^2}{4Dfn_a} \quad \ldots\ldots (14)$$

The percent savings possible with this technique, over that of facing to the center at constant rotating speed, Equation 7, are:

$$S = \frac{T_a - T_t}{T_a} 100 = 50 \left(1 - \frac{d^2}{D^2}\right) \quad \ldots\ldots (15)$$

If Equations 15 and 10 are compared, it can be seen that savings in machining time are greater when a variable-speed drive is used down to the smallest possible diameter, facing then being finished to the center at the highest permissible machine speed, than when rings are machined. Equation 15 is represented by the top curve in *Fig.* 3.

With reference to this curve, several conclusions can be drawn. If a variable-speed drive, having a ratio of lowest-to-highest spindle speeds of 1:2, is used for constant-cutting-speed facing as long as it can and is then used at its highest speed for the rest of the cut, a saving in time of 37.5 percent is realized over facing the piece at constant spindle speed. If the ratio is 1:3, savings will be 44.5 percent. With a ratio of 1:6, savings would be 48.6 percent.

It is evident that, by facing at constant cutting speed, substantial savings are possible. A multiple-speed drive, with a ratio of lowest-to-highest spindle speeds of 1:3 will be sufficient to give optimum savings in the majority of facing jobs. With the equations presented in this article, it is possible to establish correct techniques, estimate savings and evaluate possible equipment for particular jobs.

HEAT TREATING

...an important step in punch and die manufacture

By Joseph H. Bockrath
Manager, Heat Treating Div.
Wiedemann Machine Co.
Philadelphia, Pa.

Many pitfalls await the unwary in the manufacture of punches and dies. Experience has proved that as much attention must be paid to material selection and the effects of heat treatment as to the machining operations. The few precautions outlined here can save a great deal of time and money, and eliminate damaged parts.

HEAT TREATING IS ESSENTIAL for punches and dies. Yet, it is one of the most misunderstood steps in the entire manufacturing process. Not only does heat treating have a bearing on the life and quality of the tools, but it also affects their size. Dimensional changes occur during heat treating in varying degrees, depending upon the material and procedures used. As a result, either excessive grinding may be required or the toolmaker may end up with highly machined scrap.

For a specific example, consider the various steps involved in the manufacture of punches and dies for piercing stainless steel. This is one of the more difficult applications inasmuch as piercing stainless presents abrasion problems. For this reason, high-carbon high-chrome steel is the most logical material to use to assure maximum service life and prevent pickup on the punch and die. Punches and dies made of high-carbon high-chrome steel tend to retain their cutting edges longer, thus eliminating much down time of equipment and production for tool sharpening.

One of the key factors in determining the size change of the material is the tempering temperature. This is necessary to obtain the desired surface hardness. In this case, it has been decided the hardness should be 60 R_C. To obtain this hardness a tempering temperature of between 400 F and 425 F should be used, see table. With this information, the relative size change for this material can be determined, see chart. In this case, the size change for a tempering temperature of 400 F and 425 F is on the positive size between 0 and 0.0001 inch per inch of length. If a tempering temperature above 425 F were used, the material would actually shrink or lose dimension. In cases where extremely close tolerances are to be held, this could prove costly if not taken into account.

Once the shrinkage tolerances are determined, the next step is to remove stock and to make sure that it is removed equally from all surfaces where possible. On intricately shaped tools or sections where the material cannot be removed uniformly, it is

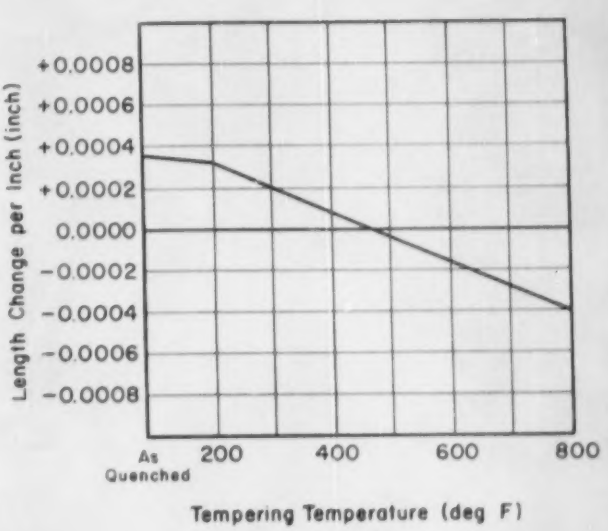
Proper heat treatment is particularly important for the "horseshoe" shaped punches and dies in the upper right. Because of their unusual shape, the working surfaces can not be ground after heat treatment.

recommended that the blank be stress relieved prior to finished machining. Although the chart referred to is an excellent rule of thumb, the contour and dimensions of the tool should be taken into account before tolerances are set. Obviously, if proper clearance is not kept between the punch and die, trouble ensues.

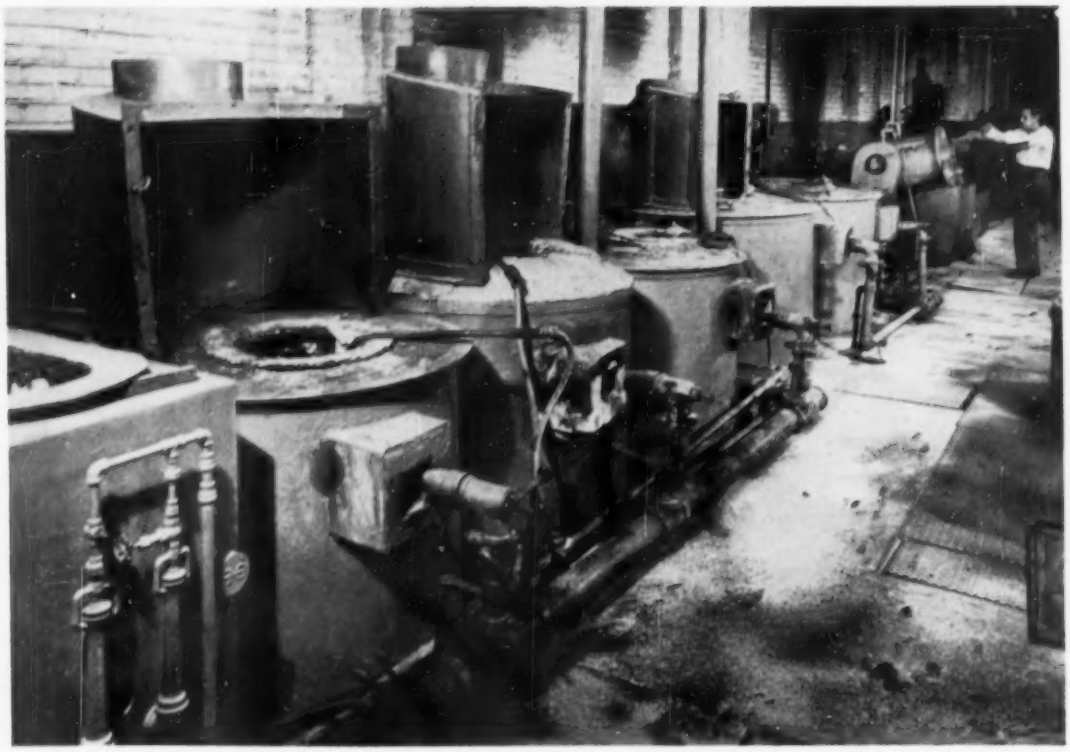
After the tools have been machined, the next step is heat treating—where cost-cutting short cuts can be taken only at the expense of quality and acceptability. In brief, a manufacturer may pay $1.25 per pound for steel, spend from one to 100 or more hours making a punch and die and then spoil it by improper heat treatment. This could include: overheating, underheating, not enough soak

Tempering Temperatures

Tempering Temperature (deg F)	Rockwell Hardness (C)
As Hardened	62/63
200	61/62
400	59/60
450	59/60
550	56/57
700	55/56
800	56/57
900	58/59
1000	59/60
1100	57/58
1200	44/45



Effect of quenching temperature on size change of ¾-inch round stock, pack hardened and air cooled from 1850 F.



Battery of salt baths and pots for hardening punches and dies.

A special spiral reamer being removed from a salt bath following soaking at the proper temperature.

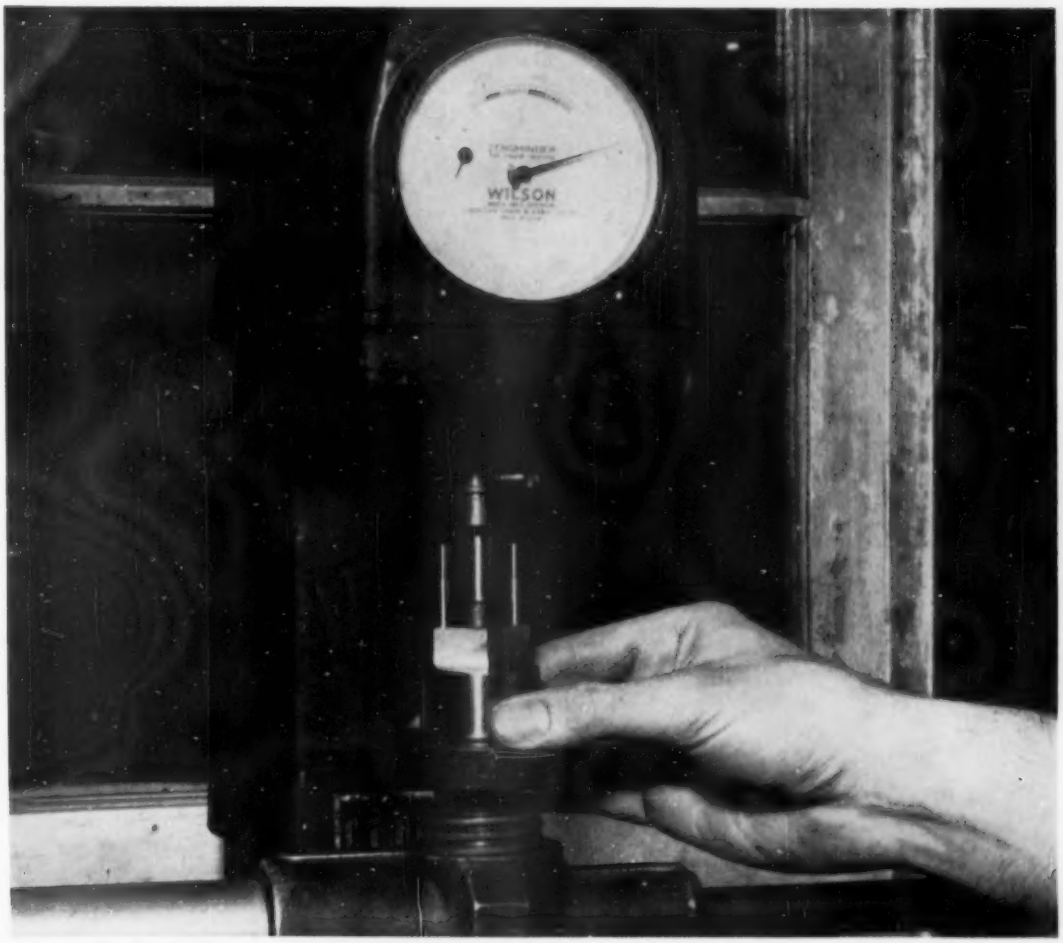
time, too much soak time, insufficient tempering time, quenching in water instead of oil, poor furnace atmosphere, use of bad thermocouples, or poor recording instruments.

Many times, particularly in dense alloys such as high-carbon, high-chrome, a single temper will meet the desired hardness requirements, but will not stand up in service due to retained austenite or untempered martensite. Here double or triple tempers are most important. Deep-freeze treatment is also helpful, particularly for gage or measuring blocks where extreme accuracy is mandatory. In this case the tools are heat treated, rough ground, deep frozen, tempered. This entire operation is repeated seven times to insure stability.

Proper heat treatment involves a number of different processing steps which must be followed in sequence. These steps include careful preheating and, if necessary, double preheating. This is to prevent cracking or distortion. Then the heated tools are superheated at the recommended temperature under controlled furnace atmosphere. In this case, the high-carbon high-chrome tools were superheated at 1825 F for 12 minutes in a neutral atmosphere.

Superheating is followed in turn by timed soaking, proper quenching and, finally, the correct time and temperature for tempering.

The total elapsed time to complete these steps was



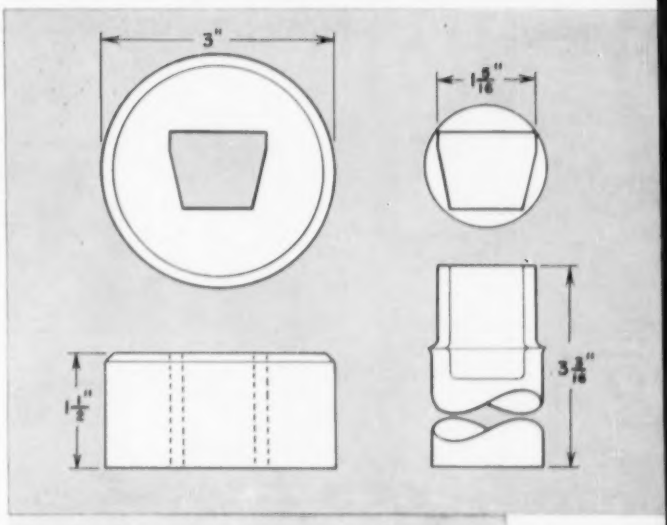
Operator positions a group punch for hardness determination following heat treatment.

approximately 14 hours, including double tempering. Any "speed up" would only have resulted in sacrifice of quality or in damage to the part.

Conclusion

It is true that many noncritical jobs can be purchased on the basis of price and delivery. However, with punches and dies, there is no choice. Heat treatment is essential and it should be accorded the same degree of interest and attention as any other production step. Unfortunately, many companies try to cut costs with cheap heat treating and end up with costly grinding or plating operations. They try to save pennies and spend dollars instead.

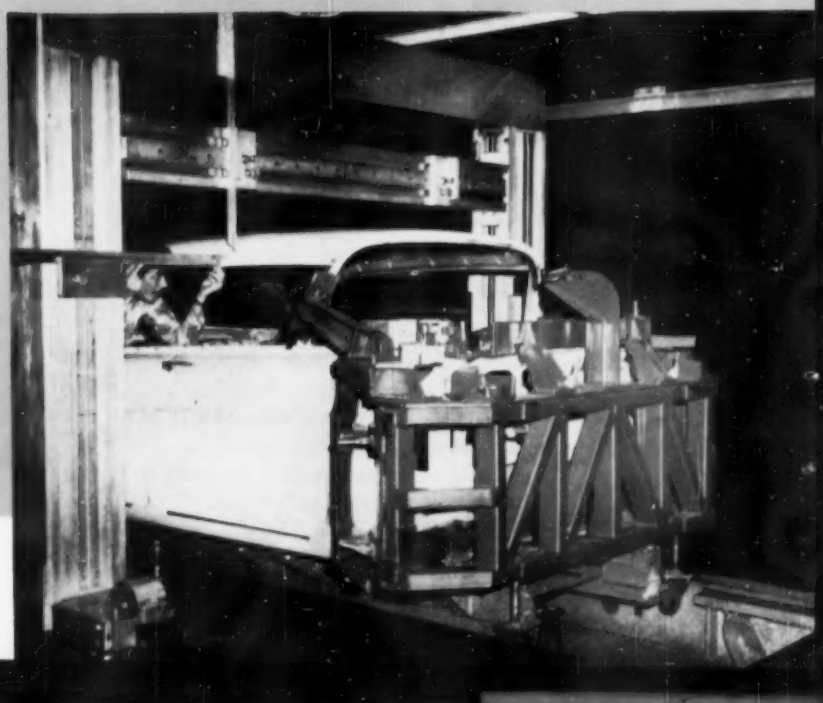
The manufacture of punches and dies requires care and precision from start to finish. Much help can be obtained from both steel suppliers and heat treaters. Mutual understanding of particular job requirements will do much to get the job done right—the first time—and at lower over-all cost.



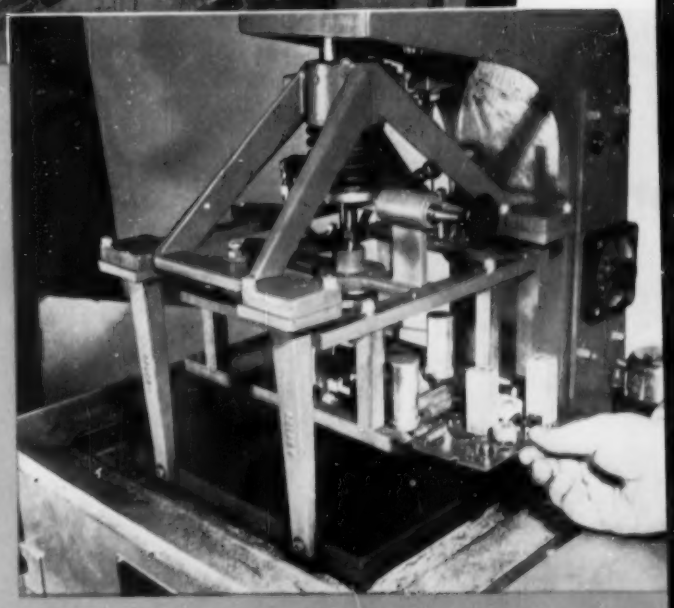
High-carbon high-chrome steel punch and die for piercing stainless steel which is described in the article.

POLYGON GRINDER can grind internal and external spherical triangles, squares, ellipses and circles. Such grinders have cut the cost of jet engine parts manufactured by the General Electric Co.'s Small Aircraft Engine Dept. Parts produced by this machine are being used as connecting links to replace parts with machined teeth. The simplified parts are quickly and economically manufactured.

BRIDGE TYPE checking fixture permits faster, more accurate measurements for quality control program at Buick-Oldsmobile-Pontiac Assembly Div. plants. Roof dimension is being checked on body in the bridge. Up to 74 dimensions are inspected on 37 basic body models. Inspection is done on a sampling basis for all models.

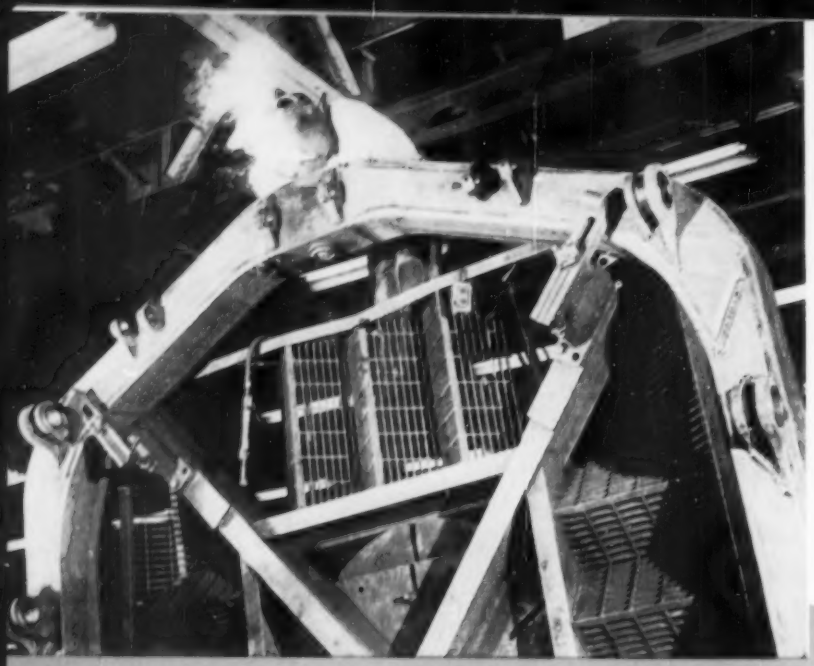


ROUGH AND FINISH MACHINING of high-alloy steel part on chucking automatic is speeded with application of carbide tooling. Three different Carmet tool styles are used on this job at Buxton Machine & Tool Co., Buffalo. Material of workpiece is 4140 steel heat treated to 150,000 psi tensile strength. Cut is taken at 134 rpm at a feed of 0.009 ipm. Cutting time per piece is about 6½ min. Tool life averages 50 pieces between grinds.



FORCED SELECTIVE SOLDERING of printed circuit boards (right) is performed semiautomatically in Autofab soldering machine developed by Mechanical Div., General Mills, Inc. Circuit boards are fed manually into holder; operation is automatic. Normal dwell time is 3½ sec. with 500-deg solder; total cycle time is about 7½ sec.

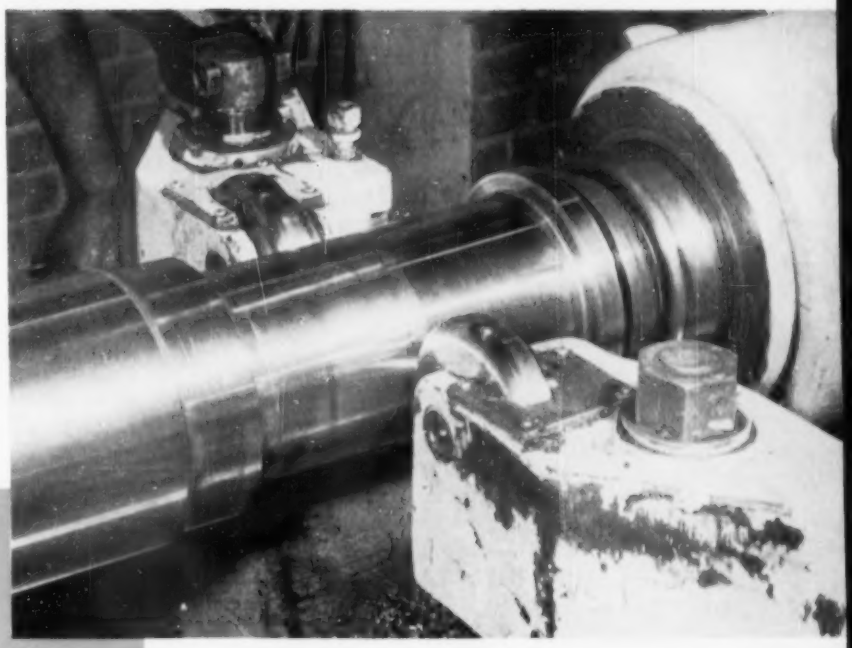
TOOLS at work



IMPROVED ARC PROCESS is used to weld C-frames at Caterpillar Tractor. These frames are used to attach bulldozer blades to tractors. Welding time for the assembly has been reduced 55 percent by a semiautomatic setup developed by Linde Air Products. The method employs a magnetic-flux, carbon dioxide gas and continuously fed carbon-steel wire. The 34 by ½-inch fillet weld in downhand position is completed in 7 minutes.

TURNING MANGANESE DRUM is job for carbide tool at Schlumberger Well Surveying Corp., Houston, Texas. The drum is designed in three pieces for easier fabricating and machining. The core is rough turned on the diameter and machined on both ends to permit alignment to the flanges, which are then welded to the core. After welding, the core diameter and inside of flanges are finish turned between centers on a 50-inch LeBlond lathe.

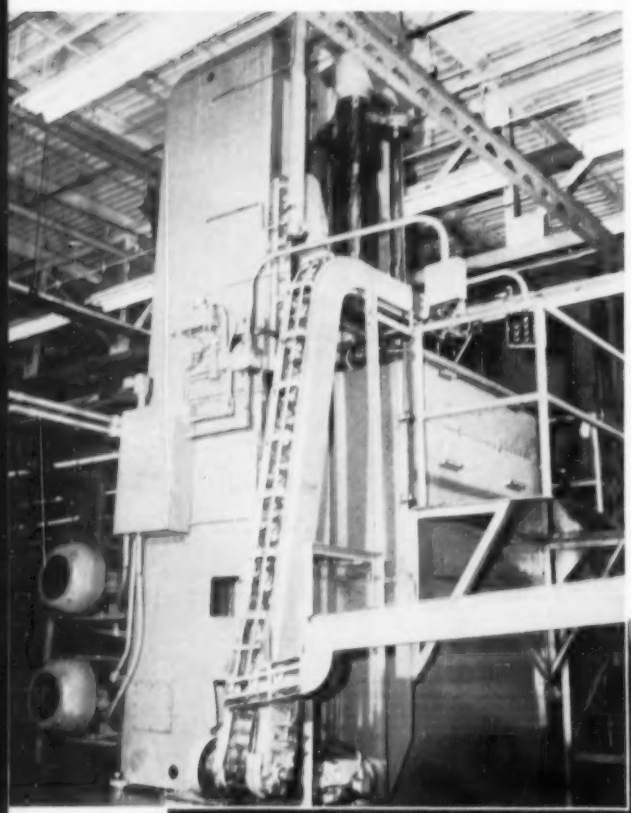
BURNISHING railroad car axle journals poses tough tool maintenance problems, solved by adoption of carbide. The rolls used in the operation are lapped and highly polished Kennametal grade 82. They must resist galling and pickup of steel inclusions in the operation, and impart a quality finish to the workpiece. Tool and setup costs have been cut markedly by use of tungsten-titanium carbides.



MECHANIZED PROCESSING may be as efficient for small lots as for mass production, in standardized machines such as this projection welder. Transmission detent assembly is welded in one stroke at Buick Div., G. M. Projection welding is used to avoid distortion of the delicate part. Air jet, sequenced by the welder ram, automatically unloads the fixture. Tooling is simple so operator can quickly load parts.

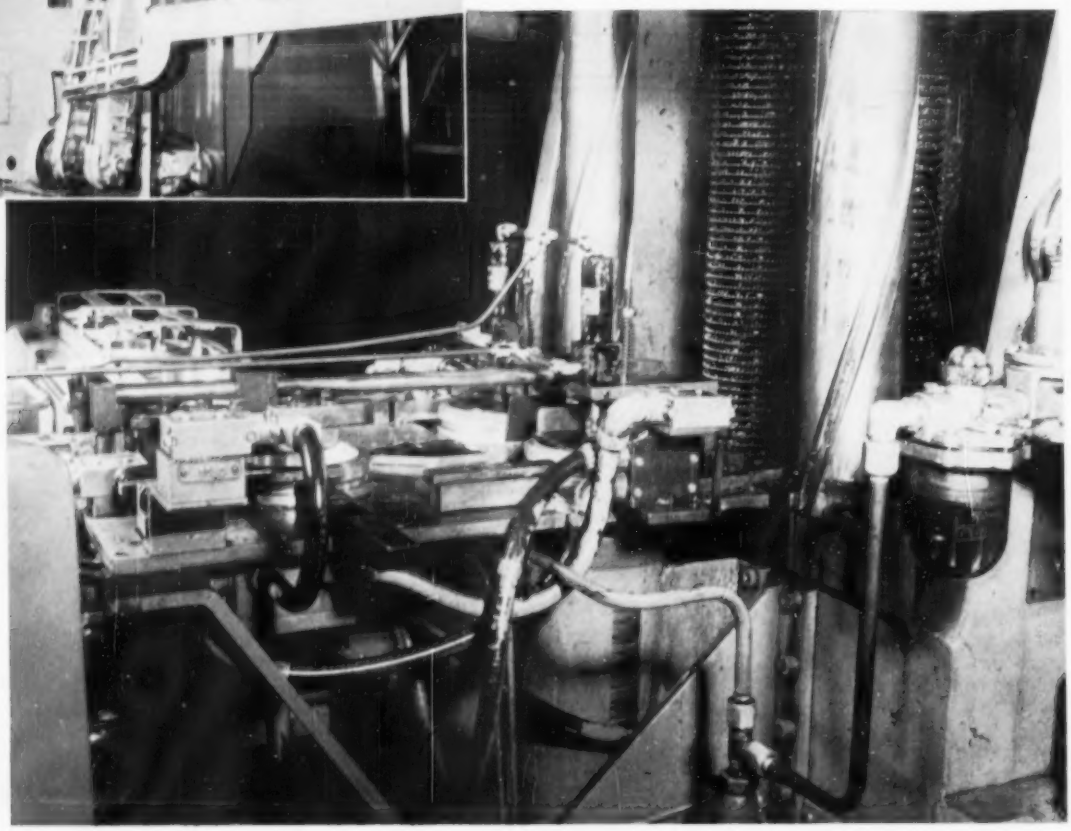
TOOLS at work

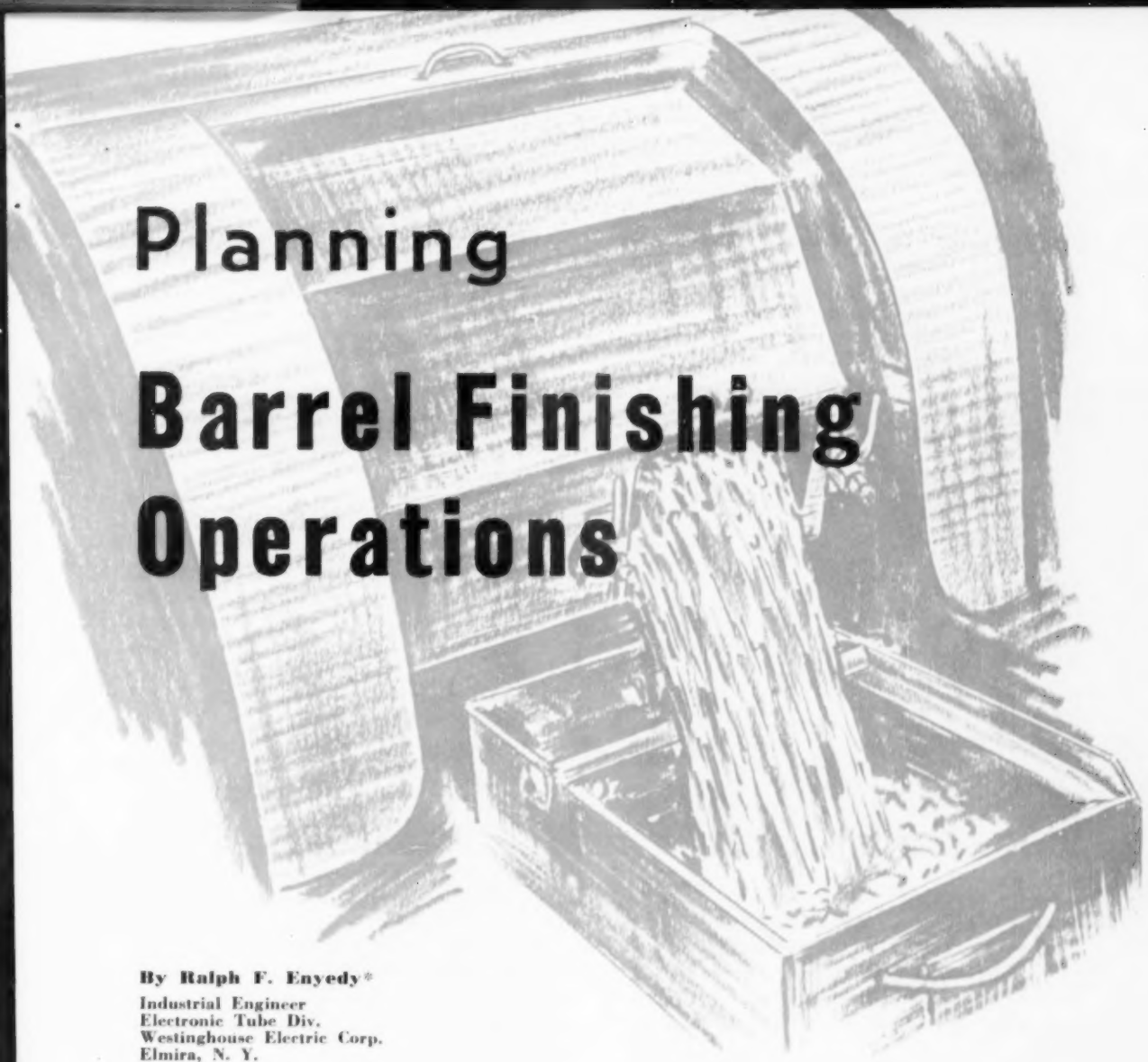
TOOLS at work



FULL AUTOMATION has been applied to the broaching of annulus gears (left) at the Chrysler Corporation's Kokomo, Indiana plant. Gears travel down a gravity chute to an elevator which lifts them about 12 feet to the work station on this American dual-ram broach.

LOADING FIXTURE on dual-ram broach (below) is fed automatically from an index conveyor. Unloading is also automatic, with the parts leaving the operation via a gravity chute.





Planning Barrel Finishing Operations

By Ralph F. Enyedy*
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BARREL FINISHING, once limited to simple deburring and descaling operations, is now being applied for precision edge-rounding, contour blending, polishing and burnishing. Advances in barrel design, improvements in media and compounds, and use of special fixtures have greatly extended the range of barrel finishing applications. Today, many manufacturers are finishing even intricate and fragile parts to degrees of precision which would have been considered impossible only a few years ago. Cost savings over hand-finishing operations are substantial and often part quality is improved as well.

To take advantage of potential savings, tool engineers must have a thorough knowledge of the capabilities of barrel-finishing methods. In short, the tool engineer's knowledge of barrel finishing should be comparable to his knowledge of machine-tool operations.

General rules for the selection of finishing equipment, media and compounds are given in "Fundamentals of Barrel Finishing," THE TOOL ENGINEER, April and May, 1957. These are not hard-and-fast rules—there are none in barrel finishing—but will serve as a guide in planning finishing processes. Often, experimental work will be required to develop the best process for a specific part.

The effect of machining operations on finishing problems should be taken into consideration at the time the over-all production process is planned. Removing the cutoff burr on a small bullet-nosed screw-machine part, *Fig.* 1, is a case in point. Nor-

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Fig. 1. Barrel-finishing operations can be expedited if cutoff burr is left on the rounded end of this screw-machine part, rather than on the flat end.

Fig. 2. Cutoff operation leaves burrs around edges of drilled hole in screw machine part.

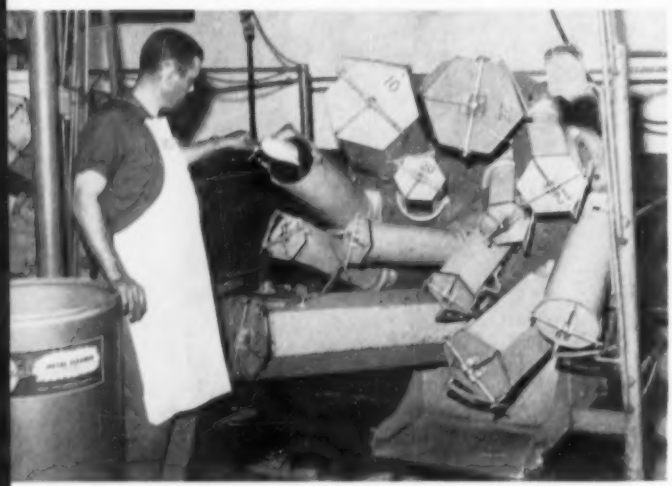

Fig. 3. Long parts with external threads can be successfully finished in multiple-barrel machines.

mally, this part would be machined to leave the cutoff burr on the flat end. If, however, the burr is left on the rounded end, the barrel finishing operation will be expedited. The reason for this is found in the action of parts and media during the finishing cycle.

At the top of each mass of parts and media in a rotating barrel there is a sliding layer where most of the finishing takes place. Parts in the sliding layer tend to orient themselves parallel to the sliding layer and follow the lines of least resistance. Thus the rounded end of the part described will meet the resistance of the abrasive and a burr on the flat end will be partially shielded. This would lengthen the work cycle and generate excessive radii on the edges of the part. If, however, the burr is on the rounded end of the part it will be exposed to maximum abrading action. The finishing cycle will be comparatively short, eliminating the possibility of excessive action on the part edges.

When tooling is planned, it is sometimes possible to replace secondary-machining operations with barrel-finishing operations, with consequent reduction in tooling costs. For instance, the cutoff operation on the screw-machine part shown in *Fig.* 2 raises burrs which project toward the center of the hole. Ordinarily, these burrs would be removed by a countersinking operation. They can, however, be easily removed in a barrel-finishing operation, which will also generate radii on all edges. An additional advantage of barrel finishing the part is that no metal is rolled into the hole—always a possibility when countersinking holes.

Many tool engineers hesitate to barrel finish parts having external threads because of the possibility of parts being nicked or otherwise damaged during the finishing cycle. Accordingly, hand-finishing methods —filing, belt grinding, scraping and polishing—are relied on for finishing threaded parts. Such hand operations are costly and it is difficult to obtain uniform quality.

Production experience has demonstrated that when barrel-finishing methods are properly applied, there is no danger of damage to threaded parts. Long parts can best be finished in long small-diameter barrels, *Fig.* 3, which constrain the parts from turning end-over-end and striking against each other during the finishing cycle. Large media—stones, wood or rubber blocks or similar materials—are also useful in keeping parts from nicking. If, due to unusual parts configurations, large media do not give sufficient protection, critical areas can be masked off.

The most reliable means of protecting threaded parts, gears, or any other parts which might be damaged if allowed to move freely in a barrel, is to design fixtures which hold parts in one position, *Fig.* 4. Large rotor disks for jet engines, magnesium housings, and other large and easily damaged parts are generally fixtured. Some barrels are equipped with mechanisms for rotating parts during the cycle to insure that all surfaces are finished uniformly. In other cases, parts are fixtured so that maximum action is obtained on selected areas and minimum action is obtained on areas requiring least finishing. Some fixtures also incorporate masks to prevent any finishing action on certain areas.

Once the decision to barrel finish a given part has been made, the sequence and number of finishing operations must be considered. Frequently, it is possible to perform several operations simultaneously. A deburring operation will, for example, improve the surface finish of a part. It may be advantageous,

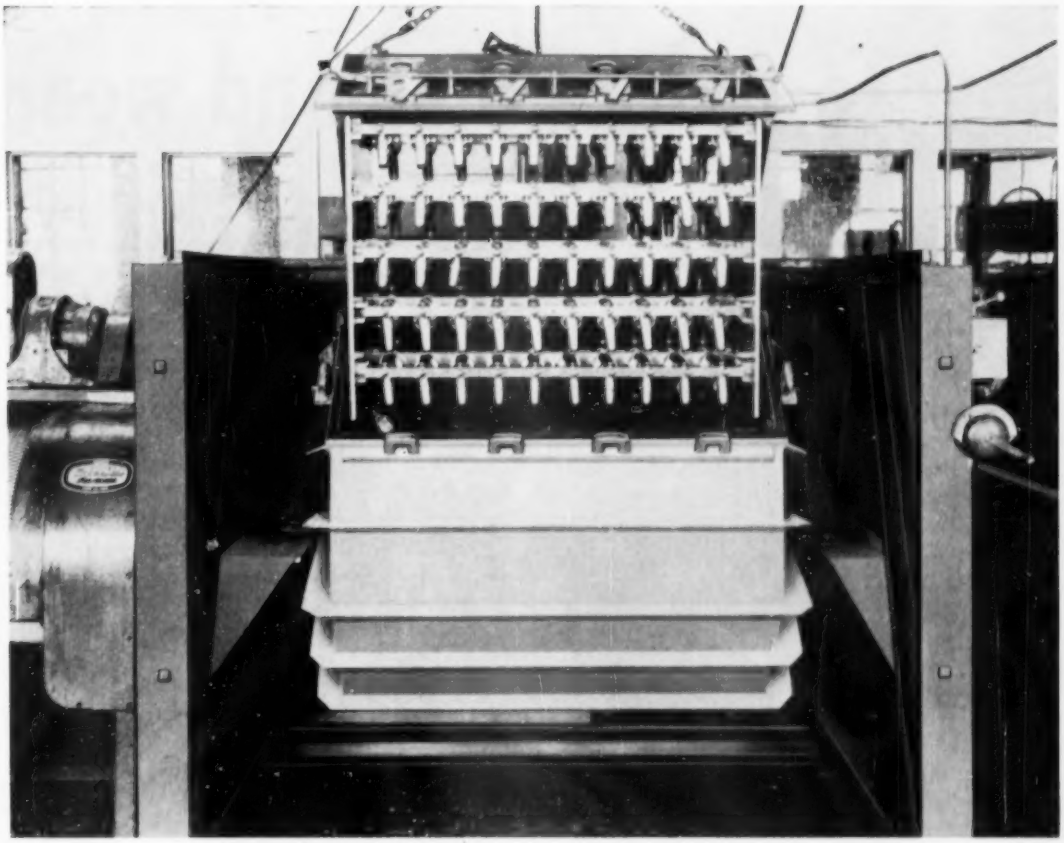

Fig. 4. (above) Rack type fixture for finishing easily nicked parts.

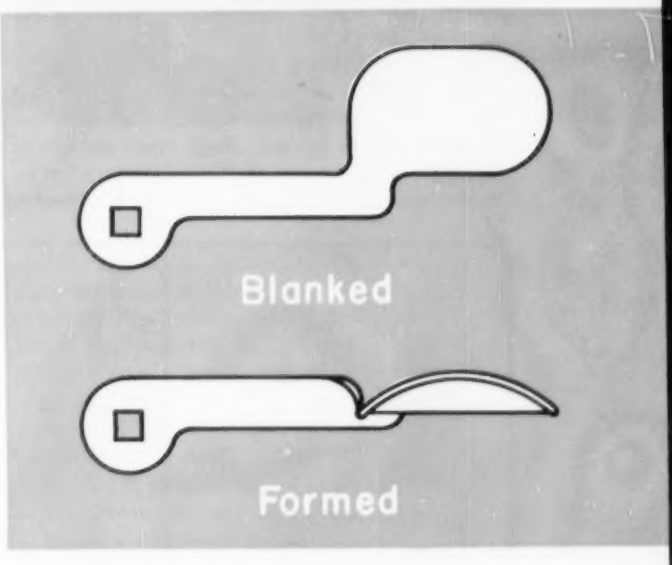

Fig. 5. (right) Small stamping is barrel finished to form radii and generate smooth finish.

however, to use separate operations for such actions.

The small formed lever shown in *Fig.* 5 is a good example of a part which can be finished in either one or two operations. All sharp edges must be rounded and a smooth finish generated over the entire part. Using a fine abrasive media, the formed part can be finished in one operation. The finishing cycle, however, will be long because the fine abrasive rounds the edges slowly.

The apparent cost advantage of finishing the part during one cycle may be offset by the fact that the equipment is tied up for a long period of time. It is usually more economical to generate the radii with coarse fast-cutting abrasive and generate the required surface finish in a second cycle, using a fine abrasive. Although the majority of barrel finishing operations are performed after all machining or forming operations are completed, in this case the rough finishing operation is performed on the blank. Coarse abrasive would not reach all surfaces of the formed part and radii would not be equal.

Successful barrel-finishing operations are, like any other successful manufacturing operation, the result of sound tool engineering. Although the barrel-finishing field is new to many tool engineers, time spent in developing barrel-finishing know-how pays off in more efficient production.

how to reduce diamond wear

By Lawrence H. Cook*
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LOCATED ON THE OUTSKIRTS of Johannesburg, South Africa, the Diamond Research Laboratory is unique in that it is devoted to pure and applied research exclusively concerned with the recovery and use of industrial diamonds. Work done by this laboratory is resulting in more effective use of diamonds as production tools.

Gem cutters have long known that diamonds were more difficult to cut in some directions than in others but the scientific study of the grinding hardness of the diamond is scarcely two decades old. It has been pointed out that the resistance to abrasion of the girdle (if an opposite pair of the six points of an octahedron are considered the poles, the remaining four points outline the girdle) is greater than any other part of the diamond crystal. This fact is now being used to properly orient diamond crystals in tools.

Early diamond wheel dressers were made by setting a natural pointed stone in a steel holder and applying the point to the grinding wheel. Crystal quality, size and shape were considered but little attention has been paid to correct orientation. Wear is comparatively great if abrasion takes place across a point from one ridge to another, View A.

Experience has shown that less diamond wear occurs if the tool is offered to the wheel so that abrasion takes place across the point from the direction of the upper flat face to the lower flat face. When the point has worn, the tool is turned through 90 deg and again used. This represents current normal practice.

Quantitative measurements of the wear on diamonds when used as dressers have been the subject of recent study. Comparative tests have been made between diamonds set normally, View B, and those specifically oriented so the girdle or ridge of the octahedron shaped stone is used as the wearing face, View C. The former direction is the most resistant to abrasion on the cube plane and the latter setting is most resistant in the dodecahedron plane of the diamond.

Results of this investigation showed that, by employing the hard vector of the dodecahedron plane (along a rib of an octahedron), longer tool life could be expected. In these tests, it was found that the rate of wear on diamonds that were used in the generally accepted way was 4 to 13 times greater than that on stones that had been oriented to take advantage of the abrasion resistance in the dodecahedron plane.

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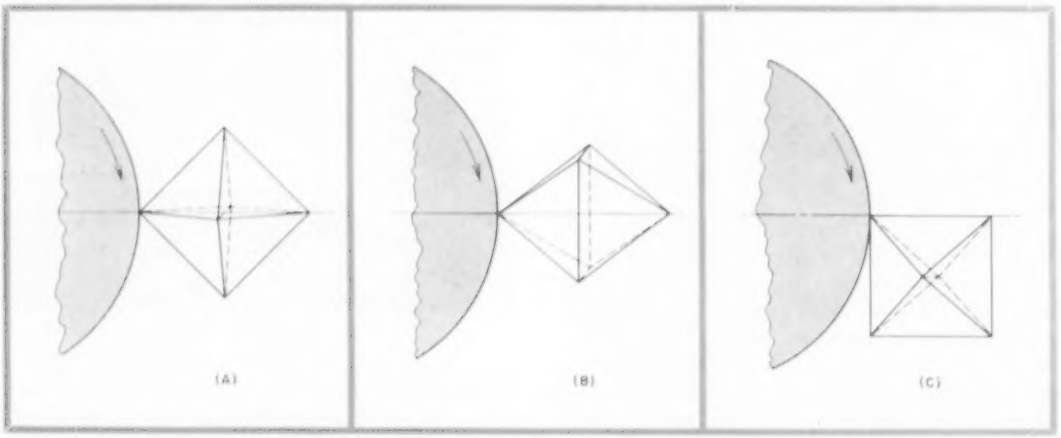

Typical octahedron shaped diamonds used as dressers for grinding wheels. Abrasion resistance of all edges of a crystal can be considered equal. In View A, abrasion is in a cube plane and is great. Although View B also represents abrasion in a cube plane, resistance to wear of the crystal is much greater in this position. Abrasive resistance of a diamond is greatest when it is oriented as shown in View C.

Homemade Tools save time and money

Fig. 1. Hard-surfaced shaper tool is fabricated from scrap but works well in production.

By S. J. Meno*
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WEAR-RESISTING SURFACES have been applied as standard practice to metal machine parts of all kinds to prevent wear through corrosion and abrasion. Little attention has been paid, however, to the possibilities of using built-up hard surfaces for metal-cutting tools. Such tools can be successfully fabricated and used, *Fig.* 1, in emergencies or as standard practice.

Cutting Tools: Lathe and shaper tools can be made easily from scrap cold-rolled steel with tips of deposited hard-facing alloys. Such a tool, *Fig.* 2, can be made in less than 15 minutes and can outwear a conventional tool if made correctly.

Milling and radius cutters can be made to suit specific operations with considerable savings. A 3 percent nickel steel body, hard surfaced with weld metal and then finish-ground to the correct size and shape, can frequently be fabricated for about one-third the cost of standard tool-steel cutters.

In a recent emergency, a deburring tool was required immediately for a particular operation. A piece of scrap cold-rolled steel was coated at one end with a hard-surfacing alloy. It was then ground to form a number of small cutting edges, *Fig.* 3. This tool was used on 1500 production pieces before it showed signs of wear.

Hard-Facing Techniques: There are several different kinds of hard-surfacing rods and electrodes available. Experience will indicate which type to use for a particular tool. One of the easiest methods of depositing a hard coating is through use of an oxyacetylene torch and a Stellite rod. Smooth, flaw-

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free deposits can be easily made with a minimum requirement for equipment.

Correct adjustment of the torch flame, *Fig.* 4, is important when applying a deposit. A flame with an excess of acetylene—recognizable by a "feather" flame three times as long as the inner cone—should be used.

The tool shank should be preheated locally with the torch to prevent possible cracking. The inner cone of the flame is then directed at the work and when the base metal appears to be "sweating," the alloy can be melted freely onto it. Care must be taken when applying second layers. If the heat is allowed to penetrate too deeply, the alloy may be contaminated by iron from the base metal. Such contamination prevents realization of the best physical properties of the hard coating. If the flame is withdrawn slowly, the new tool will cool slowly enough so that cracking will not occur. No further treatment is necessary.

Properties of Stellite lie between those for high-speed steel and cemented carbides. Tools fabricated with this material lose little of their original hardness at elevated temperatures and can outlast ordinary tools in certain operations. For example, "homemade" tool bits such as those described have a hardness of about 54 R_c but can at times be used longer than high-speed steel tools with hardness of 62 R_c.

In shops where consumption of high-speed steel tools is high or where special tools are urgently needed, use of hard-surfaced, fabricated tools should be considered. Such tools can effectively reduce operational costs if they are used intelligently.

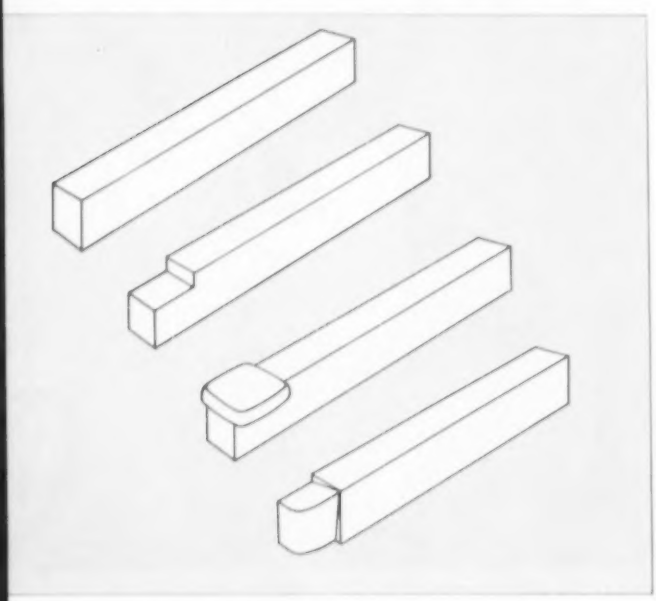


Fig. 2. Steps in the fabrication of a lathe tool that costs 25 cents to make. After shank is cut to size, a notch is ground in one end. Hard-surfacing alloy is deposited in the notch and then the correct geometry is ground on the deposit.

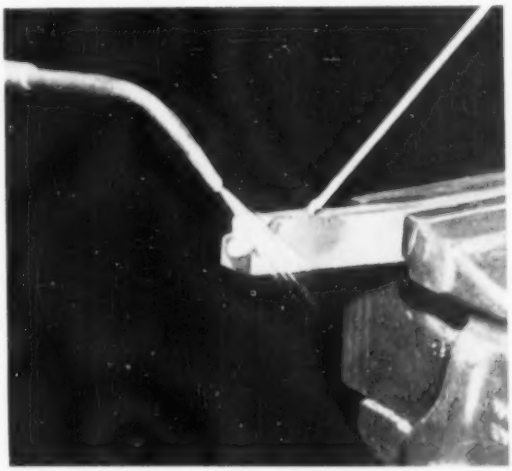


Fig. 4. The weld deposit is made with a torch having an excess of acetylene and a regular hard-surfacing rod.

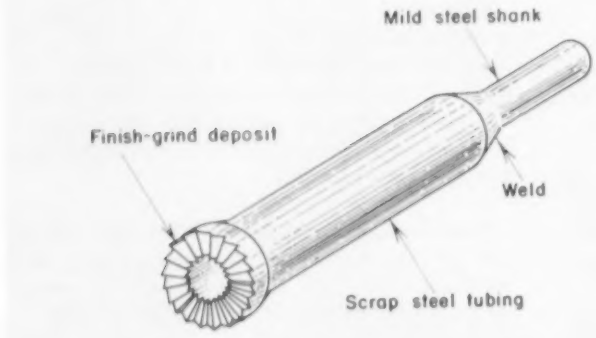


Fig. 3. Deburring tool was made of scrap materials and a deposited wear surface. It was used to finish 1500 workpieces.

Ultrasonic welding

By T. W. Black
Associate Editor

Welding with ultrasonic vibration has now reached the production stage. Foils and thin sheets of aluminum, copper, stainless steel and many other metals can be bonded at high speeds.

Fig. 1. Ultrasonic welding machine. Operator is welding aluminum foil to copper leads. Machine operates at 300 w. Low welding temperatures and absence of sparks or sputter eliminate the need for operator to wear protective clothing.

DURING THE PAST SEVERAL YEARS, ultrasonic energy has been harnessed for cleaning, testing, soldering and brazing production parts and assemblies. The latest—and perhaps most remarkable—application of ultrasonics in the tool engineering fields is ultrasonic welding. This process, originated and developed by Aeroprojects Inc., West Chester, Pa., has already passed the laboratory stage and is now being used for production in several plants.

The equipment required for ultrasonic welding, *Fig.* 1, is relatively simple—a generator to produce high-frequency alternating current, a transducer to convert the alternating current into high-frequency high-intensity mechanical vibration, a coupling system to transmit vibration to an upper sonotrode, welding tips which contact the work, and a lower sonotrode to support the work. The resonant frequency of the entire system—transducer, coupling, welding tips, and reflector sonotrode, *Fig.* 2, is carefully controlled.

In welding, the work is clamped at relatively low

pressure between the two welding tips. When the system is energized, the interfaces of the weldment are bonded together, usually within a period of one second.

The material in the weld area is in the solid state during welding. While some of the ultrasonic energy is dissipated in the form of heat, thermocouple measurements indicate that welding temperatures do not approach the melting points of the metals being welded.

The reasons why bonding occurs are not fully understood. Apparently, ultrasonically induced shear and compression vibrations cause internal deformation resulting in internal plastic flow at the interfaces of the sheets being joined. Current laboratory experiments may support this conclusion.

Most welding is done at 4,000 to 40,000 cps, but it is possible to weld at both higher and lower frequencies. In general, thick materials are welded with lower frequencies while thin materials are welded with higher frequencies.

Power requirements vary, depending on the thickness and hardness of the material. Some thin, soft

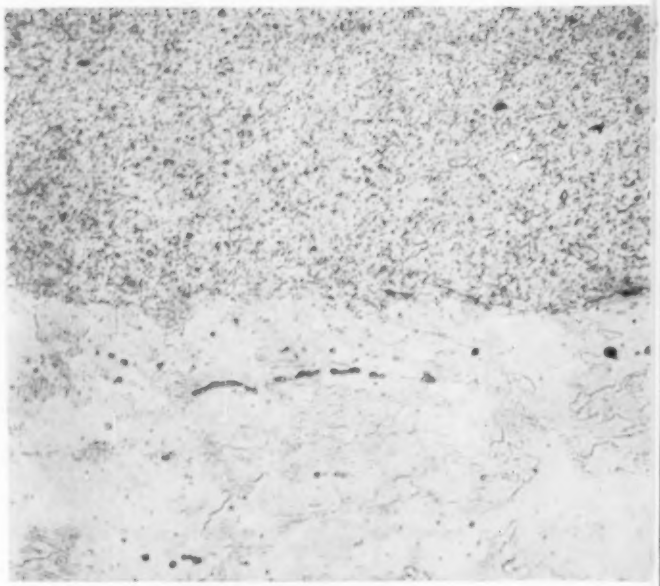


Fig. 3. Photomicrograph of 0.010-inch-thick stainless steel ultrasonically welded to Zircaloy-2, 0.020 inch thick. No cast or fusion is evident. 500X.

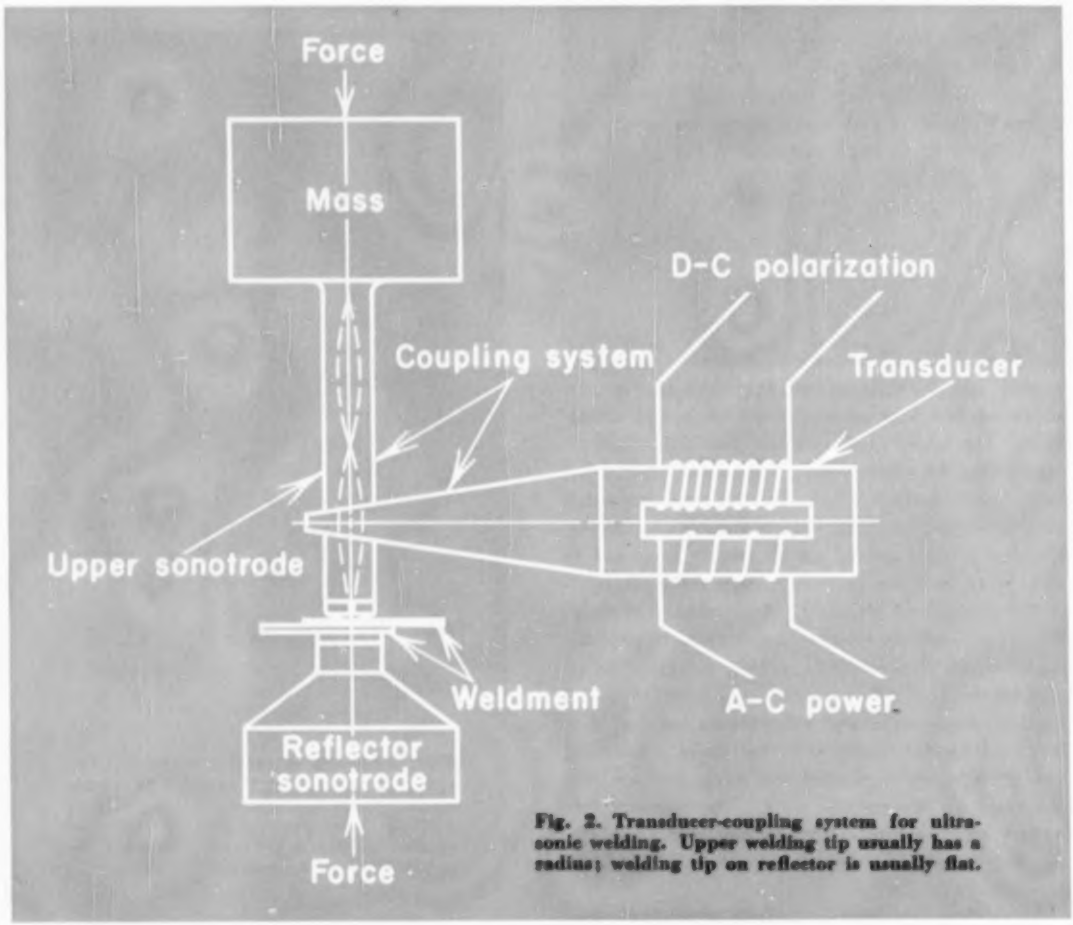


Fig. 2. Transducer-coupling system for ultrasonic welding. Upper welding tip usually has a radius; welding tip on reflector is usually flat.

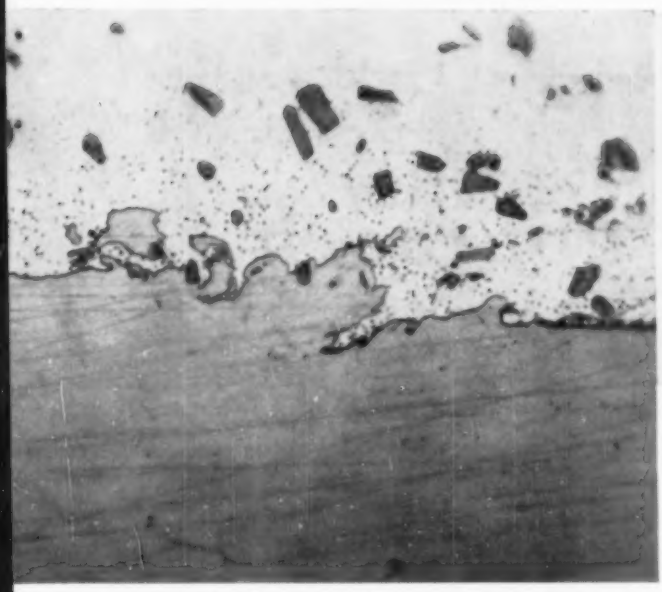


Fig. 4. Aluminum ultrasonically welded to copper. Results of internal plastic deformation and flow are evident at the interfaces of the weld. 900X.

Tensile Shear Strength of Ultrasonic Spot Welds

Material Type	Thickness (inch)	Mean Tensile Shear Strength (lb per single-spot specimen)	
		Ultrasonic Weld	Military Specification
1100-H 14 Aluminum	0.050	440 ± 20	392
2024-T 3 (Alclad) Aluminum	0.050	1750 ± 60	620
2024-T 3 (Bare) Aluminum	0.040	850 ± 80	460
5086-H 34 Aluminum	0.040	730 ± 90	415
2014-T 6 (Bare) Aluminum	0.050	1040 ± 40	620
17-7 PH (T) Stainless Steel	0.008	210 ± 10	130
316 Stainless Steel	0.010	220 ± 10	140
70-30 H Brass	0.016	340 ± 10	...

materials can be welded at 200 w; power requirements increase with increasing material thickness and hardness. Ultrasonic welders with up to 2000-w capacity are available and higher-capacity systems are under development.

The capacity of the welding head places a limitation on the maximum thickness of the metals which can be ultrasonically welded at the present time. The maximum thickness for 2S aluminum is 0.080 inch; for 24ST aluminum it is 0.050 inch. Alclad sheets up to 0.064 inch thick have been successfully welded, as have 0.014-inch-thick molybdenum sheets. Maximum thickness for stainless steel depends upon steel type and temper. Half-hard stainless-steel sheets up to 0.030 inch thick can be welded on advanced laboratory equipment. These maximum thicknesses are approximate.

Ultrasonic welding is well-adapted to bonding thin foils. Welding 2S aluminum foil, 0.0002 inch thick, presents no problem. It is also possible to weld foil and thin sheet to thick plate. Ultrasonic welding is believed to be the only process capable of making large-area thin-to-thick welds of this type.

The majority of ultrasonic welding machines are spot welders; however, ultrasonic seam welders are now in successful operation. While most ultrasonic welding has been done with foils and thin sheets, wires, rods and other shapes have been ultrasonically welded with excellent results.

One of the major advantages of ultrasonic welding is that it is possible to bond dissimilar metals, and metals such as copper which are difficult to weld by other processes. Some of the materials which have been successfully welded are stainless steel to Zircaloy, *Fig.* 3, stainless steel to stainless steel, aluminum to copper, *Fig.* 4, aluminum to stainless steel, molybdenum to nickel, Inconel X to Inconel X, zirconium to zirconium, zirconium to stainless steel, and titanium and its alloys to each other.

Power requirements for ultrasonic welding are substantially lower than for other welding methods. From 50 to 75 kva, for instance, are required for welding 0.050 aluminum sheet with conventional methods. The same sheets can be welded ultrasonically with only 4 kva. For this reason, no special circuits are required for ultrasonic generators; small models operate off 110-v current and larger models use 220-v current.

Because ultrasonic welding is performed with metals in the solid state, there is no tendency for alloys or intermetallics to form in the weld zone when dissimilar metals are joined. The absence of high temperatures eliminates the cast structure which is typical of welds made by fusion.

Usually, no special preparation of the materials to be welded, other than degreasing, is required. Low-carbon steel, coated with a plastic film, has been successfully welded, as has aluminum, anodized to a film thickness of 500 A.

The low clamping forces in ultrasonic welding produce little surface deformation in the workpiece. Deformation is always below five percent and usually below three percent. Clamping forces range from 5 to 800 lb, depending on the thickness and hardness of the materials being joined, weld size, and power requirements.

Laboratory and production experience has demonstrated that the quality of ultrasonic welds is uniform from weld to weld, and weld strength is high, as shown in the accompanying table. High weld quality, coupled with the unique ability of the process to bond similar and dissimilar metals without fusion, should result in many new industrial applications.

measuring cutting forces

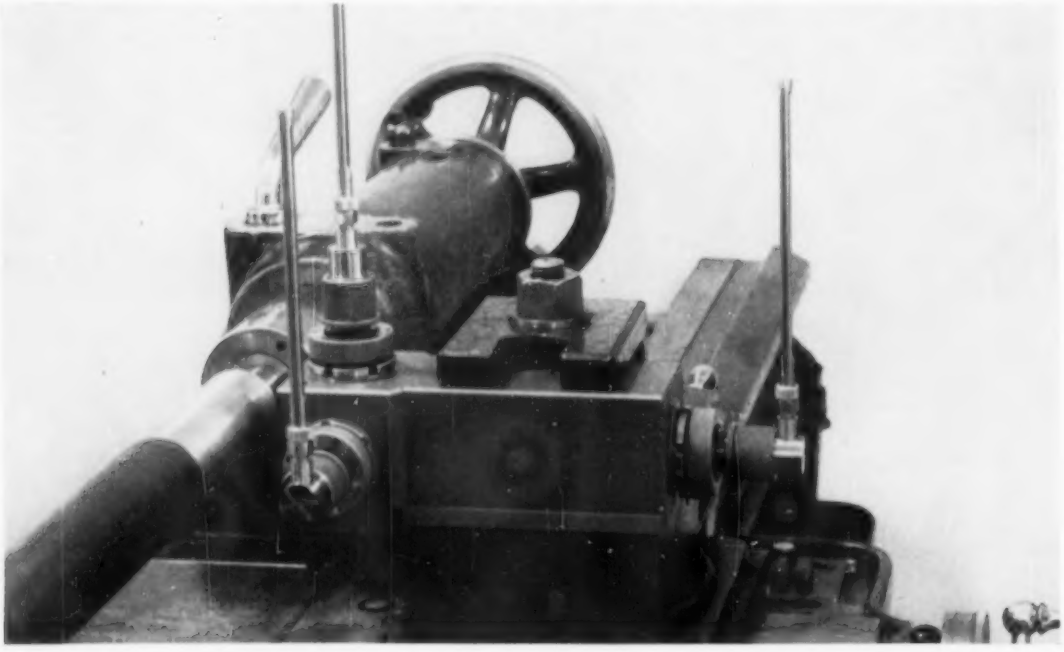
a practical approach to tool-life problems

By Pietro Chiesorin
Institute of General Technology
University of Genoa, Italy

Information concerning the influence of tool geometry, tool wear and workpiece materials on cutting forces is often of great practical value. All components of these forces can be conveniently and accurately measured with a new type of direct-reading dynamometer.

MUCH OF VALUE has been written on turning metals with single-point tools. Results obtained by various research workers, however, often differ. When apparently opposite conclusions have been reached, it is difficult to judge which conclusion is the more reliable. Seeming or real discrepancies in the findings of different reports arise for several reasons. With the great number of variables prevailing in metal-cutting operations it is not too frequently that two independent investigators carry

Fig. 1. Dynamometer mounted in lathe for test cut. All components of cutting force can be measured.



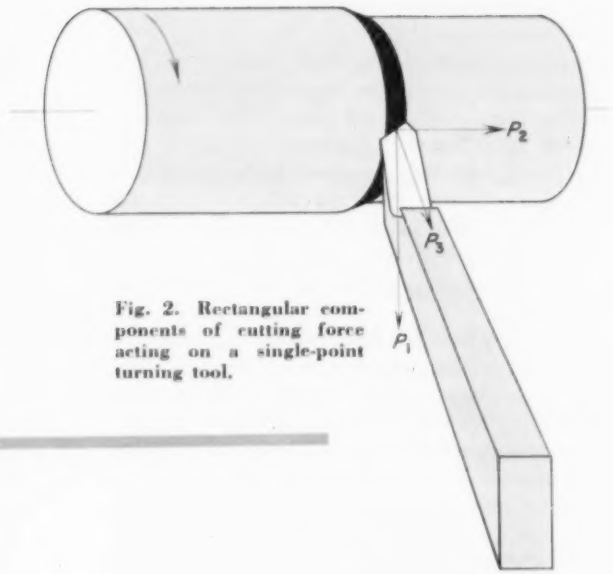


Fig. 2. Rectangular components of cutting force acting on a single-point turning tool.

out tests under identical cutting conditions or with similar methods. Thus, correlation of results obtained is difficult, and differences in some variables, especially those subject to less control, may lead to contradictory conclusions. Inadequacy of measuring methods in analysis of metal-cutting operations also contributes to this situation.

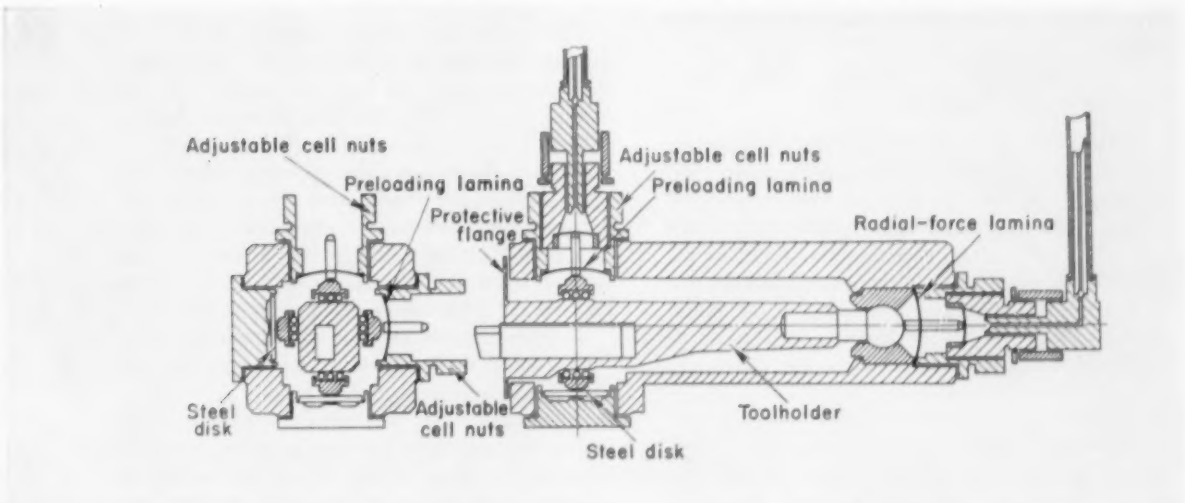
Machinability can be considered from the standpoints of cutting energy, tool life or surface finish. The interrelationship of these three elements is not completely or clearly defined at the present time. A three-component, single-point-tool dynamometer of the type illustrated in *Fig.* 1 permits investigation and measurement of the energy relations. Since any one or all of the components of the resulting cutting force can be measured with such an instrument, it is possible to determine:

1. Variation in cutting force with change in cutting speed, feed per revolution, depth of cut, tool geometry, workpiece, tool material, cutting fluid, and tool wear
2. Net power absorbed at the tool in cutting
3. Cutting energy required in terms of hp per cu in per minute
4. Over-all efficiency of a lathe based on electrical motor input or mechanical efficiency based on motor output.

Investigation of the influence of work material properties and microstructure, tool geometry, and tool wear on cutting forces most probably will supply information of the greatest practical value. It is possible, although not necessarily probable, that a good, over-all machinability index might be derived as a result of such studies. Tensile strength and hardness are only approximate indexes of relative ease or difficulty of machining. Microstructure is a better index and perhaps dynamometer tests will provide an even better index if a consistent relation between tool life and tool forces can be found. Of course, such a relation would be different, at least in degree, for the different tool materials such as tool steel, HSS, cast alloy, carbide, ceramic, cermet, and diamond.

Reports on tool-life results often are not comparative because of the variety and uncertainty of the means used to measure tool wear. In general, some type of measurement, more or less accurate, indicative of either the rate or amount of tool wear or abrasion is used. Once the relationship between tool wear and tool forces is better known, it may be practical to define intermediate wear points or the

Fig. 3. Cross-sectional views of three-component, single-point tool dynamometer.



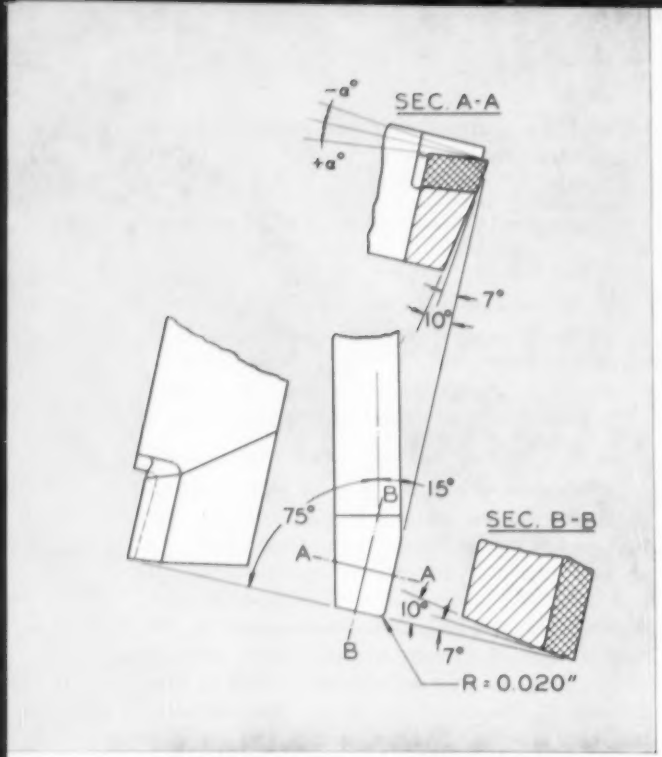


Fig. 4. Geometry of carbide-tipped tools. Top rake angle, α, had values of +10, +5, 0, −5, and −10 deg for various tests.

terminal point for tool life determinations in terms of a definite percentage increment in cutting force as compared to the value obtained with a sharp tool.

This would certainly be a simple and accurate measurement to take with a dynamometer. Although an increment of 10 percent in cutting force was used by Schlesinger to indicate a worn-out tool, much higher values are often reached in shop practice. Such an indication of the tool-life terminal point provides a simple and accurate index, but more must be known about the force-l[illegible]pattern for many combinations of cutting conditions before such an index could be universally applied, especially since all tools do not, by any means, wear out in the same fashion.

Dynamometer Features

As indicated in *Fig.* 2, the resultant cutting force is normally resolved into three rectangular components P_1, P_2, and P_3, acting at the mid-point of contact with the cutting edge, respectively in the direction of the tangent to the workpiece, in the direction of feed parallel to the workpiece axis, and in a direction normal to the first two, or radial to the workpiece axis. The force P_1 is the main or tangential component, erroneously but commonly called the cutting force since it is used in computing the power requirement; P_2, the axial component, is often called the feed force; and P_3, the radial component, is sometimes called the thrust force. The dynamometer used in these tests permits the simultaneous determination and direct reading of these component forces.

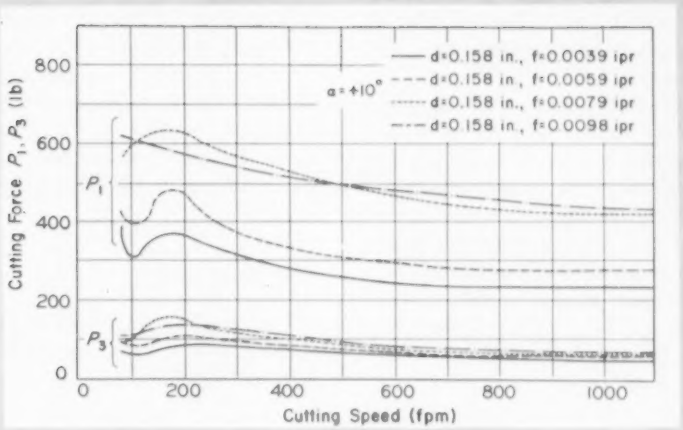
The instrument was specifically designed and built after indirect methods for determining the resultant cutting force proved inadequate. This instrument utilizes the excursions of mercury columns in semicapillary glass tubes to measure simultaneously three rectangular components of the cutting force through magnification and calibration of the small deflections of preloaded elastic steel disks. These disks restrain the toolholder through intermediate ball supports.

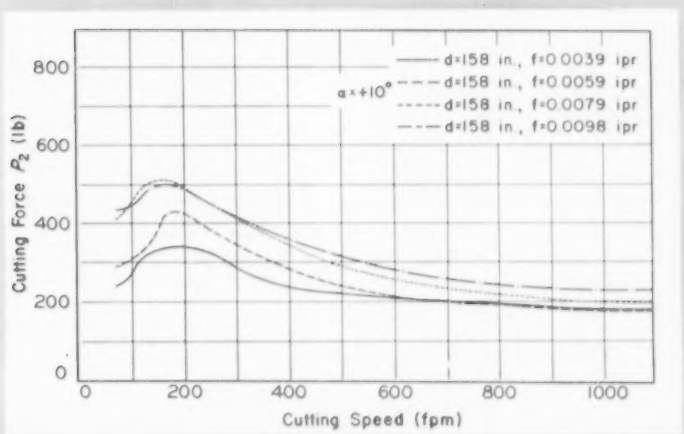
The instrument is direct reading and does not involve the use of oscillographs or electrical wiring and measuring equipment. The indicating medium, mercury, offers the combined advantages of mobility and freedom from wear. Although the principles of operation of this dynamometer are simple, construction must be accurate and high quality materials must be used.

The instrument, *Fig.* 3, is made of a strong steel body incorporating a toolholder which is restrained through special ball supports by elastic steel disks. These disks are carried by supporting plugs screwed into the body and can be replaced with disks of different stiffness to measure different ranges of cutting force. Opposite the steel disks and also restrained through ball supports are preloading laminae inserted in cell-carrying nuts. When both the cell-carrying nuts and the threaded plugs are properly mounted, the preloading laminae have deflections in excess of the maximum deformations that the bearing disks will undergo during a test. The maximum deflections of these disks are of the order of only several thousandths of an inch and the threaded plugs incorporate a center safety rest to prevent any greater deflection. Small over-all movements of the toolholder under load are amplified about 800 times by cells, each of which contains a small adjustable volume reservoir filled with mercury and thermally insulated.

The bottom of a cell is formed of a thin steel lamina. The lamina is deflected by a pin passing through the center of, and attached to, the preloading lamina. This deflection is greater than the deflection of the bearing disk during a test. The bottoms of the cells are also insulated and the pins, made of steel and plastic, have a low thermal conductivity. A semicapillary glass tube is threaded into a small fitting which in turn is threaded into the cell body. A calibrated nylon scale is inserted between the glass tube and a protective casing.

To determine the value of any component of the cutting force, the level reached by the mercury column in the appropriate glass tube is read against the calibrated scale. Setting of the mercury levels against the zero scale markings is accomplished by adjusting the nuts which control the volume of mercury in the reservoirs. Locknuts prevent alter-





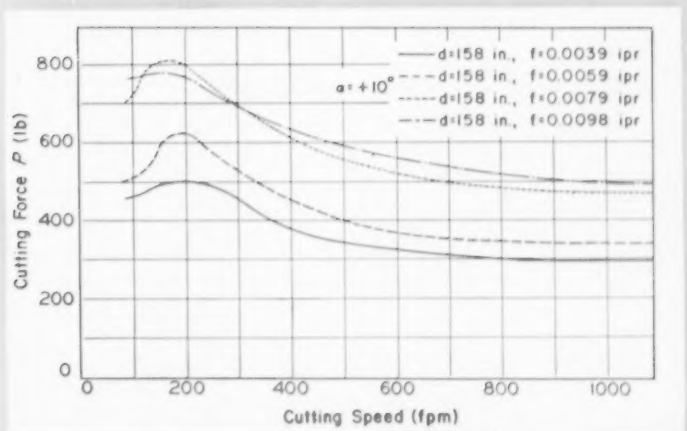


Fig. 5. Variation of cutting forces with change in cutting speed at four different feeds.

ation of the zero settings.

To determine the radial force component, P_3, the toolholder must be free to move in the direction of this force as is indicated in *Fig.* 3. The radial-force lamina is preloaded by imposing a slight controlled deflection during assembly.

Care must be taken that the centroid of the chip-tool contact area during cutting coincides with the point of application of the component forces during calibration. Tool overhang can be adjusted with two side-taper wedges and checked with a tool-setting gage. The center of the active cutting edge must lie in the intersection of two mutually perpendicular planes containing the axis of the toolholder and, respectively, the axis of the support of the preloading laminae for the tangential and feed components. Reference lines representing these two planes are inscribed on the face of the external protective flange to facilitate checking this position.

Since full scale is covered by an excursion of 6.3 inches of the mercury column, the possibilities of varying the dynamometer sensitivity over a wide range are evident. Care has been taken to reduce friction losses to a minimum by incorporating ball supports in the front and a special ball joint at the rear. The direct reading feature of this dynamometer facilitates its use both in laboratory and shop tests.

Test Procedure

Tools used in these tests were of the type illustrated in *Fig.* 4. The tool shank is a 0.60 percent carbon, water-hardening steel and a steel cutting

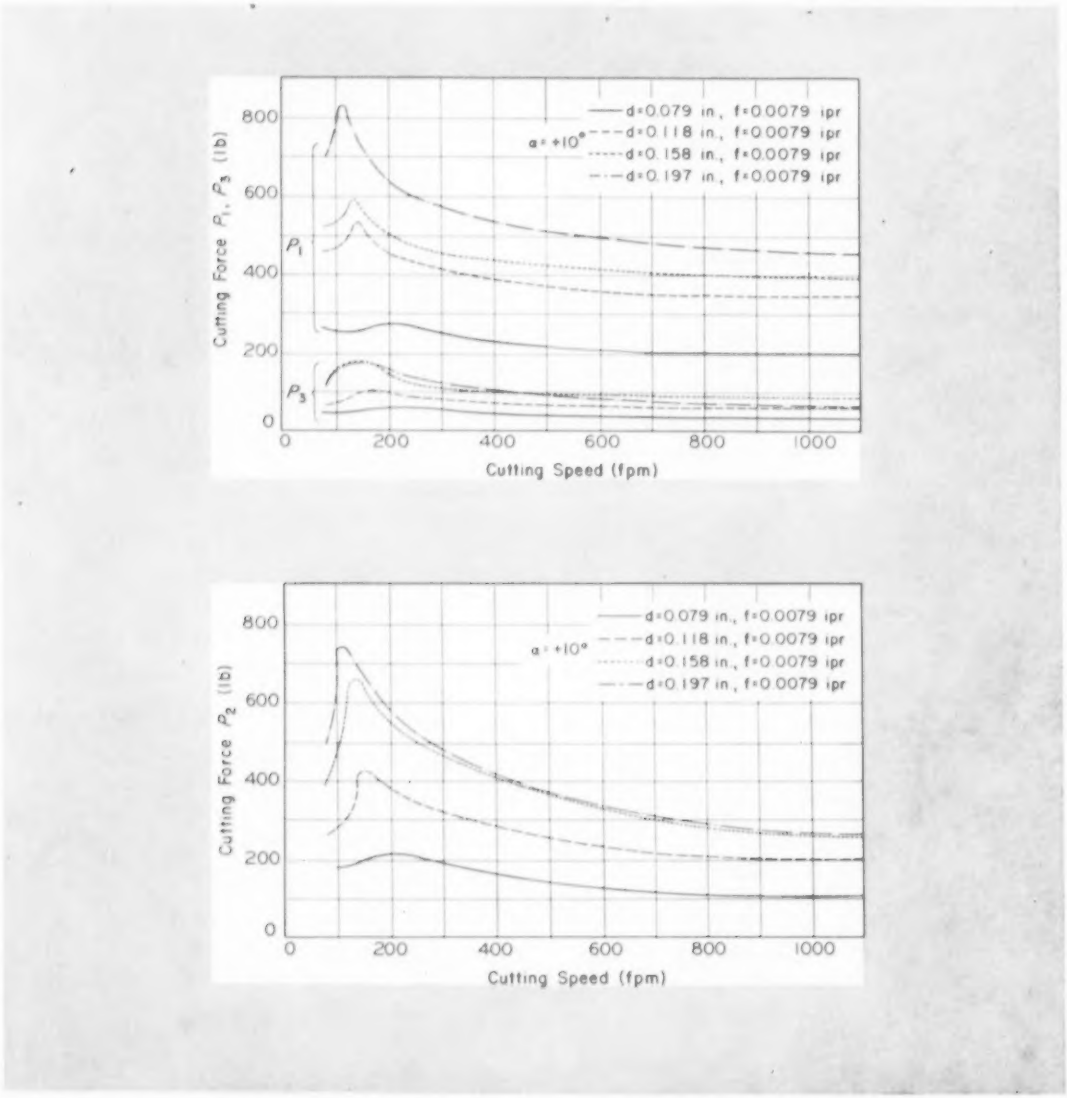


Fig. 6. Variation of cutting forces with change in cutting speed at four different depths of cut.

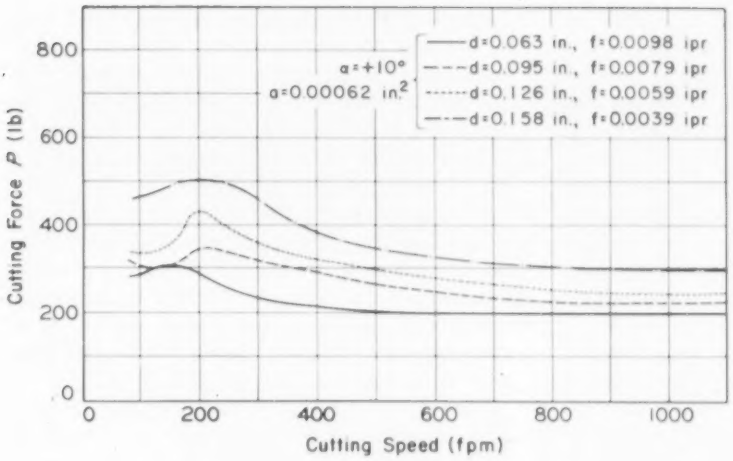


Fig. 7. Variation of resultant cutting force, *P*, with change in cutting speed at constant cross-section area of cut.

grade carbide tip is copper brazed to the shank by induction heating. The top rake angle, α, has one of the following values: +10, +5, 0, −5, and −10 deg. All tools were ground on the same tool grinder and the condition of tools was checked during the tests.

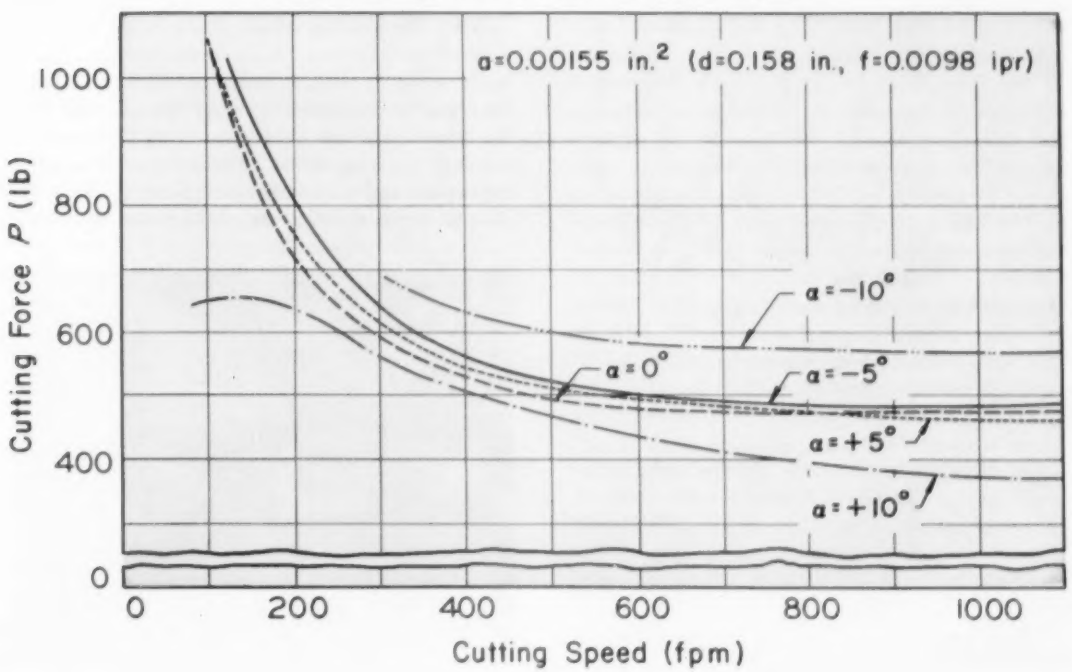
All workpieces were cut from the same bar of 5.7 in. diam, 0.30 percent carbon steel to obtain maximum uniformity from one test bar to the next. The steel was normalized by heating at 1690 F for 2 hours, followed by air cooling and annealing for 3 hours in an oven at 1290 F. As a result, the steel exhibited an ultimate tensile strength of 72,500 psi, a hardness of 165 Bhn, and an elongation of 28 percent.

Different cutting speeds from 80 to 1050 fpm, feeds from 0.0039 to 0.0098 ipr, depths of cut from 0.063 to 0.197 in., cross-sectional areas of cut from 0.00062 to 0.00155 sq in. and top rake angles from +10 to −10 deg were utilized in the tests. All tests were run dry without a cutting liquid.

Data obtained with the dynamometer are depicted graphically in *Figs.* 5 to 8, showing the cutting forces in relation to cutting speed for various depths of cut, feeds, and top rake angles.

Most of the graphs indicate that cutting forces

Fig. 8. Variation of resultant cutting force, *P*, with change in cutting speed at five different top-rake angles, α.



have a maximum value at a cutting speed between 100 and 200 fpm and decrease as the cutting speed is increased, tending to reach a constant value at speeds between 450 and 1000 fpm. At the low cutting speeds, less than 160 fpm, most of the charts show a decrease in cutting force but the pattern is irregular. Changes in both size and shape of the built-up edge, which can be substantial, can account for the variation in cutting force.

In general the cutting forces increase as the feed is increased, *Fig.* 5, but in less than a direct proportion. In other words, if the force values for P_1 are used to compute specific cutting energy, hp per cu in. per min., the specific energy values should decrease as the feed is increased. This is the case for feeds of 0.0039 and 0.0098 ipr, but the energy for 0.0059 ipr is slightly lower and that for 0.0079 ipr is higher than it should be. Behavior of the built-up edge could help to explain the apparent discrepancy that greater forces were measured at a feed of 0.0079 ipr than at 0.0098 ipr for the lower values of cutting speed.

The tangential cutting force should increase in almost direct proportion to the depth of cut except for the influence of the corner radius and the end of the tool, especially at the shallower depths of cut. If this influence is taken into account, then the cutting force should increase in less than a direct proportion as the depth is increased. The ratio of depth of cut to corner radius increases in these tests from 4 to 10 as the depth is increased from 0.079 to 0.197 in. The above suppositions are verified in *Fig.* 6 with the exception that the forces for a depth of 0.118 in. are generally greater than they should be.

When cross-sectional area of cut, the product of feed and depth of cut, is held constant while both the feed and depth are changed, the resultant cutting force behaves as shown in *Fig.* 7. The combined influence of feed and depth can be seen and is in good agreement with the supposed individual influences mentioned.

The curves in *Fig.* 8 indicate that cutting force increases appreciably as the top rake angle is changed from 10 deg positive to 10 deg negative. The differences in performance among the 5 deg negative, 0 deg, and 5 deg positive top-rake tools at the higher speeds is much less than might be anticipated. That the 5 deg positive top-rake tool actually entailed higher cutting force than the 0 deg rake tool at speeds below 800 fpm was unexpected.

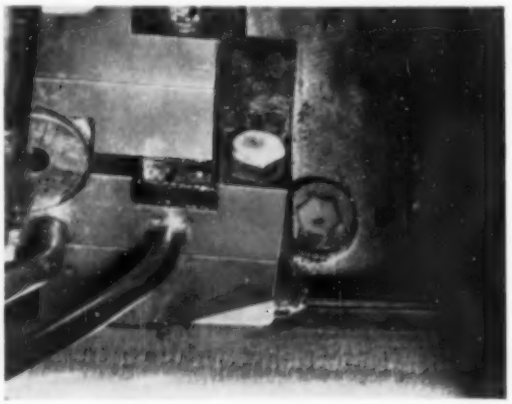
Of course, these observations and conclusions apply to the particular tool-work material pair tested. Behavior of other tool-work material pairs, under the same or different cutting conditions, can be investigated equally well with the dynamometer.

High Frequencies Weld Tubing

Advantages for tube fabricators are growing out of successful ultra high frequency resistance welding. Basically the process, which is an adaptation of the New Rochelle Tool Corp.'s Thermatool technique, is the same as the Johnson process in that it produces an edge surface weld and employs the electric resistance principle. However, it operates at frequencies of 450,000 cps as compared to 60, 180, 240 or 440 cps; and uses a set of stationary welding shoes in place of copper rolling electrodes.

Results of testing and development thus far are encouragingly successful providing proper forming and other adjustments are maintained. Accurate alignment of the steel edges prior to welding is necessary in order to produce a uniform weld joint since little or no pressure is exerted on the edges by the welding shoes.

The ultra high frequency process reduces internal splatter caused by fluctuations of current at the point of upset of two edges of steel. (Excessive splatter is a mill problem but can cause shipping delays.) In addition tubing produced by the newer method seems to have good fabricating quality because use of welding shoes results in a reduced heat line in "as-welded" tubing. This lessens need for positioning the weld area when flattening or bending resulting tube. Furthermore, because of high-speed and uniformity of welding heat, the ID flash is low and can be maintained at a minimum.



Sliding contacts, which are sources of high frequency current, heat edges of the butted tube, bringing them to welding temperature. Pressure rolls then force the edges together to complete the weld.

Formulas

for tools that face past center

By Allen M. Johnson*
President
Oak Knoll Engineering Service
Springfield, Mass.

THERE IS LIMITED cross-slide space on single-spindle automatic screw machines, so some forming tools also face the end of the workpiece. If the workpiece is solid, the facing part of the tool must extend beyond the center of the workpiece to avoid leaving a projection. Tools designed to face 0.015 inch past center, including a 0.005-inch nose radius, give optimum results.

When calculating tool radii and steps for circular tools, *Fig.* 1, there are five known factors:

A = distance tool faces past center
B = top rake angle
C = tool offset
R = largest tool radius
r = work radius to be cut.

Using these known factors, it is possible to calculate the tool radii and steps as follows:

$$\sin E = \frac{C}{R}$$

$$\sin F = \frac{A \sin B}{r}$$

$$G = 180 - (B + F)$$

$$H = \frac{r \sin G}{\sin B}$$

$$R_1 = \sqrt{H^2 + R^2 - 2HR \cos (B + E)}$$

The known factors for calculating tool radii and steps for straight tools, *Fig.* 2, are A, B, D and r. Symbol D represents the front clearance angle. Sin F, G and H are calculated with the same formulas used for circular tools. An additional unknown, S, is calculated as follows:

$$S = H \cos (B + D)$$

It will be noted that the triangle A-r-H is the same for both circular and straight tools. This triangle is shown, greatly enlarged, as an inset in *Fig.* 1.

*Senior member ASTE Springfield, Mass. chapter.

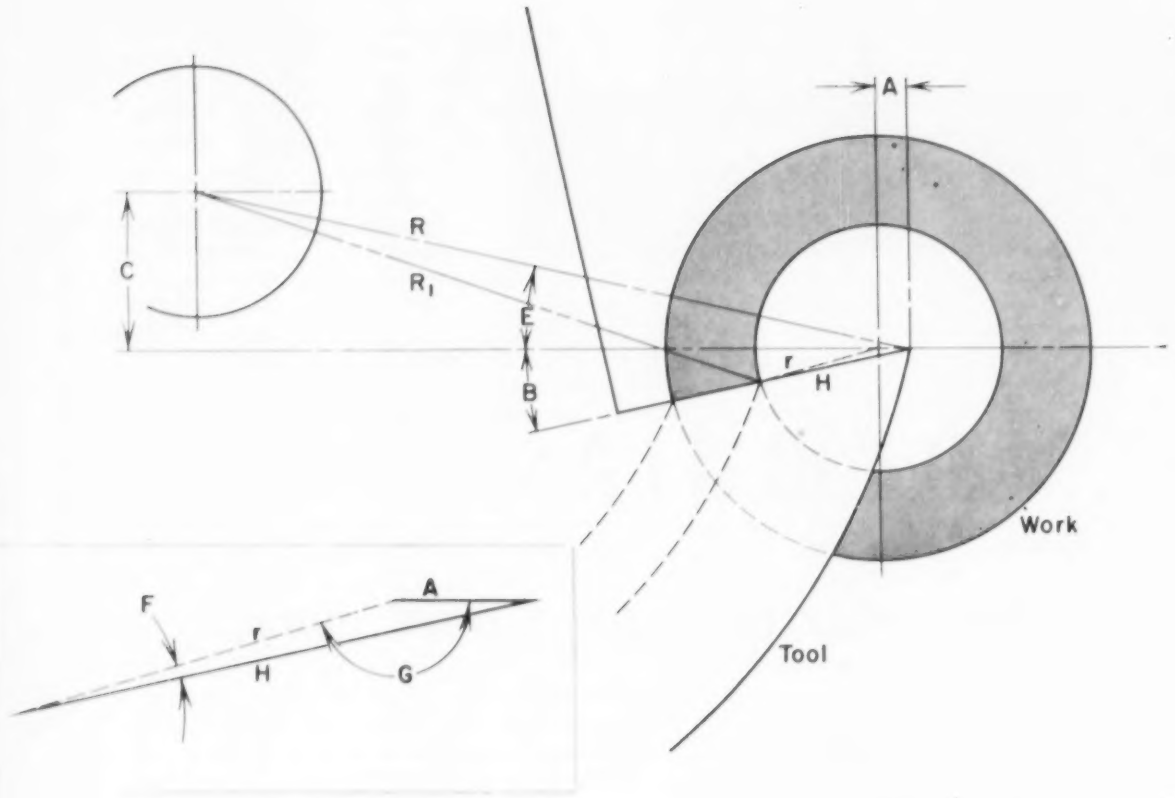


Fig. 1. Tool radii and steps for circular tools.

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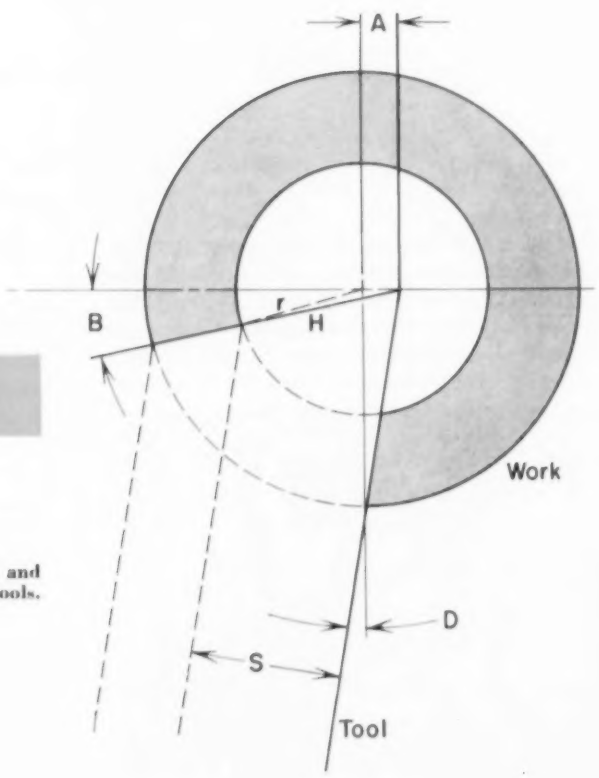


Fig. 2. Tool radii and steps for straight tools.

ASTE NEWS

featured this month

Society Looks to the Future 125

Top-Flight Panelists Spark Milwaukee Program 126

Bradley Conference Success Story 128

Dynamic 8-Day Convention Takes Shape 132

Leadership Conference Goes Annual in '58 134

National Spotlight 135

Members on the Move 136

Chips and Chatter 137

chapter news

Binghamton 143

California Chapters 142

Erie 143

Golden Gate 142

Greater New York 143

Houston 143

Lansing 141

Los Angeles 142

New Haven 143

Oakland County 142

Philadelphia 141

San Diego 142

San Fernando 142

San Gabriel 142

Santa Ana 142

Windsor 141

Society looks to the future

Directors accept challenge of Technical Leadership

"As a Society, we have the responsibility of leadership. One way in which we can—and must—exercise that leadership is in promoting and supporting scientific, engineering and technical education, particularly in the field of tool engineering. Time, effort and money expended along these lines will pay rich future dividends, not only for our Society, but for the entire national economy."

These were the opening remarks of President H. E. Collins, spoken before the Board of Directors and National Officers and Committee Chairmen at the Board's semiannual meeting, held October 31 and November 1 in Milwaukee. First order of business was the installation of Frank F. Ford of Atlanta and Edmund Hollingsworth of Philadelphia, the two new directors elected last March by the House of Delegates.

Executive Secretary Harry E. Conrad, in his semiannual report, gave voice to ASTE's forward look, saying "The ASTE Educational Program could provide a *training center* with facilities for postgraduate training, short refresher courses and specialized seminars. ASTE is not necessarily limited to the foregoing, and one does not have to exercise much imagination when appraising our opportunities education-wise." Toward this end, the Directors passed a resolution, stating that ASTE shall take immediate steps to develop a program which will provide the necessary facilities and methods at the earliest possible moment for the professional development of the tool engineer.

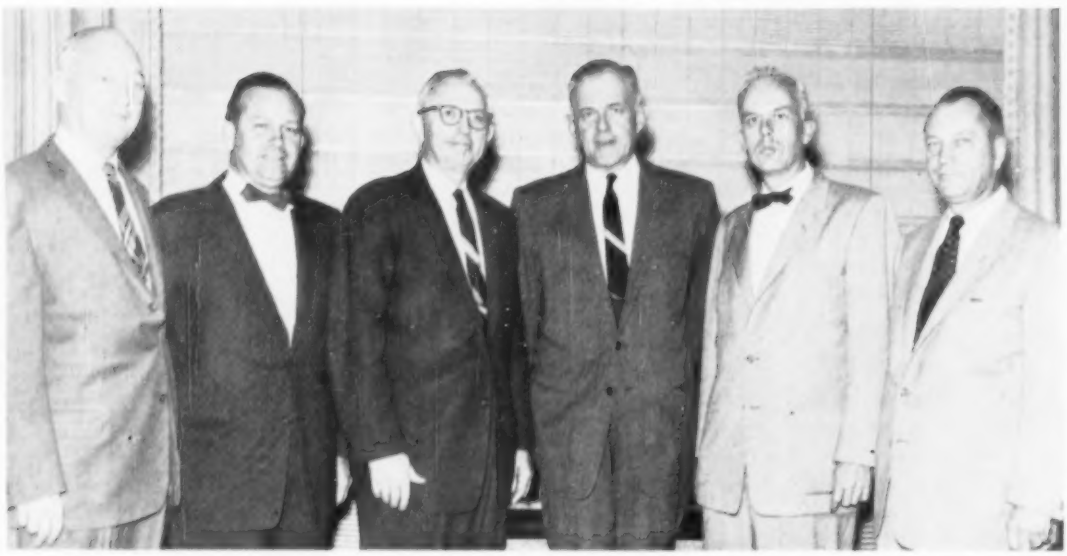
In addition to the optimistic future planning in educational directions, the Society is continuing its research activities through the medium of the ASTE Research Fund Committee. Newest member named to the committee is Swan Bergstrom, executive vice president and general manager of The Cincinnati Milling Machine Company. He is also a past president of the National Machine Tool Builders Association, and past chairman for the U. S. Government Committee on Machine Tools. James R. Weaver, manager of manufacturing and engineering for Westinghouse Electric Corporation, was re-elected chairman of the Research Fund Committee.

In addition to the receiving of reports of committees and officers, and approving budgets and programs for the forthcoming year, President Collins named members of the nominating committees for officers and directors with Board approval. Nominations for Board of Directors will be made by a committee consisting of Dale Long, chairman, Irving H. Buck, Vern Loeppert, William Clark, and William A. Thomas. Past President Howard C. McMillen will head up the nominating committee for officers, other committeemen being Philip Marsilius and G. Ben Berlien.

During the closing hour of the Board meeting, it was announced that Philip Marsilius had been elected president of the National Tool and Die Manufacturers Association at a meeting of that group being held simultaneously in Chicago.

November:
industry and education month

Top-Flight Panelists



Panelists and Milwaukee officers pose at briefing session prior to the program that asked, and answered the question—"What Do Industry and Education Expect of Each Other." They are, from left: George Riordan and Lawrence A. Wacker, Milwaukee chapter's chairman and vice chairman; Moderator George A. Parkinson, vice provost of the Milwaukee Extension of the University of Wisconsin; Rodgers G. Wheaton, president of Line Material Industries, representing industry's viewpoint; Arthur B. Drought, dean of engineerig at Marquette University, voicing education's expectations; and Milwaukee chapter's national delegate, Ralph Lund.

Spontaneous volleys of questions and answers between three distinguished representatives of education and management posed, and answered, the question of "What Industry and Education Expect from Each Other," at the Milwaukee Industry and Education Night program November first.

Raising the curtain on a month devoted to programs of this nature by ASTE chapters across the country, the Milwaukee program was planned around a panel discussion moderated by George A. Parkinson, vice provost of the Milwaukee extension of the University of Wisconsin. Taking industry's stand was Rodgers G. Wheaton, president of Line Material Industries, while the voice of education was sounded through the words of Arthur B. Drought, engineering dean, Marquette University.

Asked by Dr. Parkinson what constituted a good risk in potential managerial material, Mr. Wheaton responded with a list of eleven characteristics attributing to leadership, in his opinion. They were: energy of all kinds, nervous as well as physical; a sense of purpose and direction; enthusiasm; friendliness; integrity; good judgment; intelligence; imagination; curiosity; a sense of humor; and the ability to put others first and oneself second.

Dr. Drought pleaded with industry to refrain from taking a genius in engineering or the sciences and pushing him into a position of leadership. "Make him a top technician," he said, "but don't force him into less productive channels."

Directors, officers, national committeemen and headquarters staff who had attended the Board meeting earlier that day at the Schroeder Hotel in Milwaukee, were the guests of the Milwaukee chapter at the red-letter event. Held in the sumptuous surroundings of the Wisconsin Club, the program began with a social hour and dinner for 400, and culminated in a dance following the panel talks.

Spark Milwaukee Program

Working closely with Milwaukee in its program and publicity planning were Dick Bacik, National Program Committee administrator; and Gloria McClure, staff public relations assistant, here discussing the night's agenda with Chairman George Riordan, right.

Harold E. Collins, right, ASTE's president, views the crowd of some 400 chapter members and local industrialists and educators who were guests at the meeting. Also counting noses with "Rip" is host of the evening, Geo. Riordan, Milwaukee chapter chairman.

Helping along the festive atmosphere of this milestone event for the Milwaukee chapter are the ladies present. Wives of members and guests were invited, making the affair an official Ladies Night. The panel discussion was preceded by dinner and was followed by dancing later in the grand ballroom of the Wisconsin Club.

tips on planning a winner

Duane Brighton

Bradley Conference SUCCESS Story

Recipe for success in organizing and executing a record-smashing on-campus conference includes a blend of top technical topics and well-seasoned speakers, plant tours for the 'see-it-in-action' aspect of engineering applications, an almost split-second timing of activities, and the added drawing card of an outstanding women's program. Proof of the pudding was the enthusiastic reception shown by all participants at the Seventh Annual Illinois Tool Engineering Conference held at Bradley University in Peoria, Illinois, November first and second.

Surprise bonus ingredients which topped off the conference potpourri were: one university president holding his audience spellbound while predicting future trends in the field of engineering education; one president of the American Society of Tool Engineers pointing out the need for getting maximum returns from a wise investment of today's mental resources; one ASTE vice president, by chance also president of Scully Jones & Company, giving visual emphasis to the challenges of the tool engineering profession; and one vice president of Caterpillar Tractor Company expanding on the danger of relaxing our diligence in developing and applying technological information by a wasting or misdirecting of energies.

Master chef who concocted this gourmet presentation was Duane Brighton, general chairman of the conference, past chairman of the Peoria chapter and a member of ASTE's National Finance Committee. Sponsored by all the Illinois chapters of ASTE, the National Education Committee and Bradley's departments of industrial and mechanical engineering, the conference program was served up to some 400 tool engineers, many traveling long

Chairmen of four of the sponsoring Illinois chapters ascend to the banquet room of the Student Center. From left are Daniel J. McKeon, Tri-Cities; Walter D. Fraser, Rockford; Harold L. Smith, Fox River Valley; and George R. Armstrong, Louis-Joliet. Other sponsors include host chapter, Peoria, and the Decatur, Springfield and Chicago chapters.

Bradley University's president, Harold P. Rodes, points out the unusual architectural features of the newly completed Student Center to Peoria's chairman, Leo H. Johnson, left, and ASTE President Harold E. Collins. Both Mr. Collins and Dr. Rodes presented talks on forward-looking concepts of training future engineers.

distances to attend. Mrs. Brighton's excellent plans for the entertainment of accompanying wives drew 75 women participants.

Theme of the conference technical sessions—"Latest Developments"—was projected into the categories of materials handling, contour machining, transfer machine application and design, and chip removal. The speakers were not only schooled in a thorough knowledge of their subjects, but also had a flair for illuminating, and in many cases witty, presentation of material. Harry Conn's clear-cut explanation of "Optimation" and Charles Hautau's side-splitting and simultaneously idea-laden talk on "Product and Process Redesign for Automation" were but two examples of the technical fare available.

First key speaker of the conference was Dr. Harold P. Rodes, Bradley's youthful president. His

Appearing at the session on chip-removing tools, are, from left, C. D. Savage, speaking on latest tapping processes; H. C. Miller, on diamond tool technology; Moderator F. C. Mergen, head of Bradley's industrial engineering department; Session Chairman S. E. Rusinoff from Illinois Tech's ME department; and Carl Oxford, Jr., speaking on modern drilling techniques. A simultaneous session covered transfer machine application.

Banquet speakers check their order of appearance on the program. From left are C. A. Woodley, vice president of Caterpillar Tractor; W. L. Naumann, manager of Caterpillar's Peoria plant; and ASTE Vice President H. Dale Long.

thought-provoking discussion of the educational hurdles in training tomorow's engineers noted present trends, more and more to be adopted during the next ten years. His insight into the problems of enrollment, curricula and faculty brought out the following points: The tremendous increase in students matriculating in engineering studies during this period will call for refined screening and counseling methods to insure only top quality students in the technical curricula, and to provide constructive relocation of misplaced engineering students to the other important areas of science, administration and liberal arts. The screening and preparatory training provided by technical institutes and two-

Speaker Long illustrates the world's exploding population figures with balloon, representing man, soaring to new heights.

Conferees register Friday night at Keystone Steel & Wire Company, which, along with Caterpillar Tractor, was toured by the visitors, as a scheduled part of the conference program.

year junior colleges can be effective in reducing the overload now present at higher levels of engineer training.

Dr. Rodes noted the trend to revise curricula in the direction of more generalization. He cited the need for specialized courses in technical skills, plus additional courses in supervision and management techniques and the humanities, to better prepare the graduate for the various phases of his professional development. He offered possible solutions to the lure for teachers of industry's dollars. One possible antidote is a cooperative arrangement with industry to supplement teacher income. Another is utilization of older and younger teacher material: more efficient use of graduate assistants and younger faculty members with teaching ability, plus continued employment of teachers beyond the present retirement age provided their health allows this.

National Vice President H. Dale Long's kit of props used to illustrate his banquet speech, included some of the very newest metallic and synthetic materials now being used, which will challenge the ingenuity of tool engineers in adaptations for untold uses.

Bradley University's Student Center, setting for the luncheon and dinner meetings, was a revelation in modern functional architecture. Its design includes bold use of color, utilization of many new plastic and synthetic materials for striking effects and easy maintenance, and the development of the multipurpose room idea to provide for infinitely varying activities of its energetic student users.

Helen Gallagher, left, proprietor of her own nationally known gift shop, shows a piece of her milk glass collection to Mrs. H. H. Austin of Peoria and Mrs. Ed Schenk from Freeport. Ladies also visited Vonnchen's Junction, replica of an old-fashioned railway station converted to a restaurant, and various points of interest on Bradley campus.

Photo courtesy of Philadelphia Convention and Visitors Bureau

Dynamic 8-day convention takes shape

The City of Brotherly Love will add its historical charms and attractions to the many-faceted program being planned for ASTE's 26th Annual Meeting and Tool Show. Convention Manager Dick Bacik has announced the selection of three downtown hotels for official convention activities. ASTE headquarters, including registration areas, will be set up in both the Sheraton and the Benjamin Franklin, during the eight-day period from May first to eighth, and for the two days preceding the opening. The Bellevue-Stratford will quarter many of the technical sessions, including the metal-cutting symposium.

First major event, the Philadelphia Day Luncheon to be held in the Sheraton's Grand Ballroom on opening day, will launch the activity-filled schedule of plant tours, women's activities, banquets and luncheons, technical meetings, and such official Society functions as the meetings of the House of Delegates and the Board of Directors. The reinstituted Leadership Conference and an educational 'Career Day' devoted to attending students will also be added to the list of convention plans.

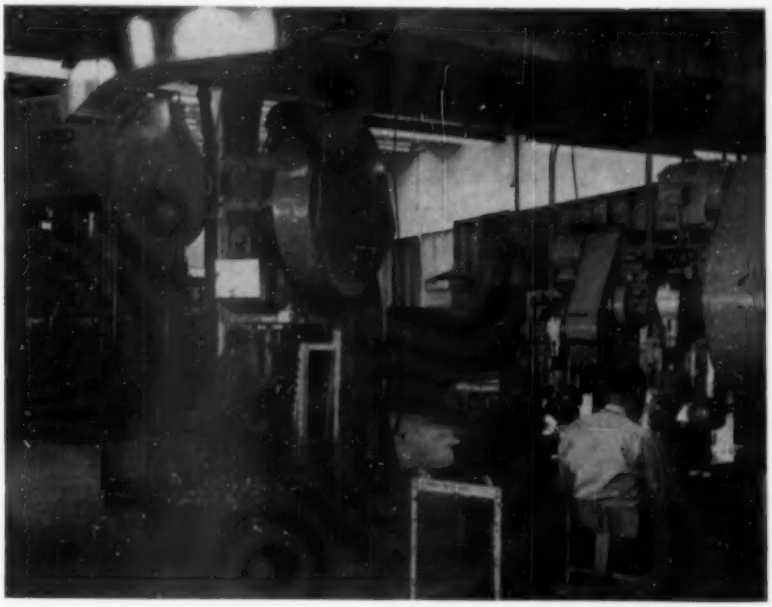
In addition, the Philadelphia host chapter has planned as a special activity, a day in Atlantic City, Sunday, May 4. By special invitation of the mayor, convention-goers are invited to sample the healthful sea air and the variety of entertainment available in "The Playground of the World." Chartered buses will leave the hotels in neighboring Philadelphia at nine in the morning, and will return to the city at nine that night, allowing sightseers to spend a full day in the fabulous town.

The Ambassador Hotel will be the Atlantic City headquarters for visitors from the convention. It has been scheduled as the scene of a social hour with music and entertainment late in the afternoon, followed by a dinner prior to the return bus trip.

Important dates to remember during convention week are: Monday, May 5 — Leadership Conference and Luncheon and National Honor Awards Dinner; Tuesday, May 6 — Eli Whitney Luncheon and Leadership Dinner; Wednesday, May 7 — House of Delegates meeting, Election of Officers, President's Reception, and Installation Banquet; and Thursday, May 8 — Board of Directors Meeting and Directors' Luncheon.

All during the eight days, of course, technical sessions and the Tool Show will be in full swing at Philadelphia's renowned Convention Center.

Men, machines and ideas meet in Philadelphia's Convention Center when the annual Convention is in town. Tool exhibits and technical sessions abound here.



Plant tours of outstanding local industries find a place on the busy schedule.

A day in Atlantic City is being planned by the Philadelphia host Convention for Sunday, May 4.

Investment in manpower

...leadership conference goes annual in '58

Proclaimed a resounding success with lasting benefits by chapter leaders who participated in the 1953 Leadership Conference, this two-day event is slated to reappear as a regular feature of the Society's Annual Meeting, beginning with the 1958 Convention in Philadelphia.

A recent change in ASTE's Bylaws prescribes that the national delegate and his alternate will be the newly elected chapter chairman and first vice chairman. This will promote an eager audience for the wealth of information available at the conference. It will provide un unparalleled opportunity for the two highest-ranking chapter officials to be schooled, at the outset of their terms of office, in the lore of ASTE: its history and objectives, national policies and operational procedures. It will also provide an important insight into chapter operation, particularly through an exchange of information with leaders of other chapters.

Individual's Loss Is Chapter's Gain

The dedication of the Headquarters Building was an economical excuse for holding the first Leadership Conference, and those attending had certain of their travel expenses reimbursed by a special allocation from the national budget. Before the close of 1953, the directors voted to change the name of 'chapter delegate' to 'national delegate' to better describe the liaison between the national and chapter level organizations. Although no further Leadership Conferences occurred during the four succeeding years, a National Delegates' Conference was instigated and held each of these years, so that news of current national activities or projects could be transmitted directly to the local chapters through their official representatives.

It will be noted that through the constitutional change, the retiring chapter chairman, who historically has been named national delegate in most ASTE chapters, will not be attending the Leadership Conference or the Annual Meeting of the House of Delegates in 1958, the year of the changeover. Although he as an individual will lose the opportunity of gaining this experience, the chapter as a whole will benefit through the leadership training of the men who will conduct chapter activities for the forthcoming year or, in the case of the alternate, the next two years. Thus, this action will result in an immediate investment in future manpower.

"Sauce for the Gander" Restaged

The 1958 version of the Leadership Conference will be patterned after the original one, with several new twists being added. The two-day agenda scheduled for Monday and Tuesday, May 5 and 6, at the Sheraton, will include two morning sessions devoted to the analysis of chapter problems, and one afternoon meeting designed to acquaint delegates with current information on national projects and goals. The second afternoon will be devoted to reports on the problem analysis studies, meetings of special interest groups and a repeat of the dramatic presentation "Sauce for the Gander," first staged at the '53 Conference, and performed by Headquarters personnel. This humorous portrayal of a typical ASTE chapter brought down the house at its first showing.

The work sessions of the Conference will be interspersed with breakfast meetings, receptions, luncheons and the Leadership Banquet, held on the evening before the House of Delegates session.

In the national SPOTLIGHT

Tool Engineer editor is conference keynoter

Theodore Black, associate editor for THE TOOL ENGINEER, was keynote speaker at the Third Annual Contour Machining Conference held in Los Angeles, October 23. His talk, "The Age of Explosive Technological Developments," traced the history of important inventions, pointing out that technological development depends in large measure on a free interchange of information and data. He further explained the role played by magazines in promoting such an interchange, and defined the editor's function in prescribing the most effective presentation of practical technical material to the field of tool engineering.

Cleveland, Chicago book Ceramic Tool Seminar

The Ceramic Tool Seminar, first held during ASTE's Annual Meeting in Houston last March, and repeated as a regional effort in St. Louis three months later, has been scheduled for duplicate performances by the Chicago chapter on December 12, and by Cleveland on January 24, 1958. This highly successful series of technical sessions on ceramics was chosen as a starting point in developing other seminars for presentation in various sections of the country where industrial conditions and a concentration of chapters would make such a seminar economically practicable.

The seminar program was originally assigned by the Society's officers as a special headquarters project and has been developed and tested under the supervision of Program Director Leslie Fletcher, and the National Program Committee. Late in October, the responsibility for the Seminar program was transferred to the National Education Committee and Education Director Gilbert Seeley.

Arthur Colton named Standards Administrator

Appointment of Arthur Colton to the post of staff administrator for the National Standards Committee has been announced by Harry E. Conrad, executive secretary of ASTE. Mr. Colton has been acting in the capacity of assistant editor of THE TOOL ENGINEER magazine since December, 1955. He fills the staff vacancy created when George Hargreaves, Data Sheets editor and former standards administrator, had his Data Sheets responsibilities increased to full time.

Prior to his position with THE TOOL ENGINEER, Mr. Colton acted as engineering co-ordinator for Arthur Colton Company; as engineering sales consultant with the R. P. Scherer Corporation; and as office manager and engineering adviser to the American Machine Products Co.

members on the move

J. K. Loman

The Kokomo, Indiana firm of Stout and Loman, Indianapolis, has been appointed exclusive Indiana representative for the Wiretex Manufacturing Company, Bridgeport, Connecticut. **Morris S. Stout** and **John K. Loman** are both members of Indiana ASTE chapter.

Floyd A. Wrasse, Mansfield, has been promoted from assistant superintendent of the stamping division, to manager of plate and stamping sales with the Empire Steel Corporation.

M. S. Stout

H. George Krushwitz, San Fernando, has been named shop superintendent at Titanium Fabricators, Incorporated, Burbank, California.

Crucible Steel Company of America has announced the appointment of **Lester C. Hill,** Pittsburgh, as assistant sales manager of its Pittsburgh Crucible Sales Division.

Cleereman Machine Tool Corporation has appointed **W. H. Jorgensen** and **W. Gerald Tyson,** both of Fond du Lac, as general manager and engineer for all engineering design, development and research, respectively.

Lionel Corporation of Irvington, New Jersey, has announced the appointment of **Quentin Gualtier,** Northern New Jersey, to the post of assistant plant superintendent.

L. C. Hill

Quentin Gaultier

F. A. Barnes

Appointment of **Frank A. Barnes,** Syracuse, as director of quality control for the Carter Carburetor Division of ACF Industries, Incorporated, has been recently announced.

Two senior members of ASTE appeared on the program of the Third Annual Contour Machining Conference. **Alfred H. Petersen,** San Fernando chapter, employed as producibility methods engineer by the California Lockheed Aircraft Corporation, presented a paper titled "Some Producibility Aspects of San Fernando Valley Advanced Aircraft Structures." **Leon E. Laux,** representing The Martin Company, an affiliate member of ASTE, spoke on "The Introduction of Numerical Control at Martin." Mr. Laux is chief of manufacturing research and development there.

David M. Gaskill, Cleveland, has been named manager of industrial product sales for Airborne Instruments Laboratory, Mineola, New York.

Announcement was made of the appointment of **James J. Walsh,** Erie, as general manager of the Tool Supply Company, Cleveland.

Ron Howells, public relations chairman of the Sydney ASTE chapter, has been visiting Japan, U.S.A. and the Continent on business. **Matt Finlay** of the Editorial Committee, and **Albert Welsh,** chairman of the Constitution and Bylaws Committee, have recently made changes in their business relations: Mr. Finlay has relinquished his appointment as tooling engineer of Le Tourneau to become works manager of Davids Shephard, Pty. Ltd.; Mr. Welsh has given up his connection with Wickmans Ltd. to devote full time to operating his own business, National Machinery Company of Hurtsville.

Lloyd M. Price, Columbus, has been appointed an abrasive engineer for the states of Minnesota, North and South Dakota for Bay State Abrasive Products.

Julius Soled, Monmouth, is the author of the newly released "Fasteners Handbook" published by Reinhold Publishing Company.

Arvid O. Lundell, Detroit, has been appointed adviser to the director of the Metalworking Equipment Division of the Business and Defense Service Administration, U. S. Department of Commerce. Mr. Lundell is the author of a number of articles appearing in the technical and business press in the metalworking field in recent years.

D. M. Gaskill

R. F. Richards

J. J. Walsh

Robert Bevis

Robert F. Richards, Chicago, has recently been promoted from sales coordinator to industrial products application engineer, in the Chicago office of Vickers, Inc.

Richard D. Schmidt, Peoria, design engineer with Associated Engineers, has recently become a Registered Professional Engineer.

Robert Bevis, Cleveland, a registered professional engineer, has been promoted to the position of assistant sales manager of domestic sales, The Cincinnati Milling Machine Company.

D. J. Bond, Detroit, has resigned as district manager of the Lapointe Machine Company, to become sales representative of the Special Products Division of the Colonial Broach Company.

L. M. Price

D. J. Bond

A. O. Lundell

Chautauqua-Warren

The Town Club, Jamestown, was the scene of the October 3 program, featuring Marvin Bunting, National Headquarters staff administrator, who presented some interesting suggestions and comments relating to chapter activities.

Cincinnati

The annual visit to an industrial plant was the occasion for a tour of the Champion Paper and Fiber Company in Hamilton on October 8. Seventy members journeyed by bus to the Eaton Manor in Hamilton for dinner, then on to the Champion plant where all phases of the production and inspection of coated paper products were followed by the tour's interested participants.

Chicago and Lima

Harry Conn, chief engineer, Scully-Jones & Company, was the featured speaker at Lima chapter's technical meeting in the Clemans Building, October 17, and Chicago chapter's October 14 meeting at Nielsen's Restaurant, where 130 members were present. Mr. Conn spoke on "Optimation—The New Machining Concept," showing slides to further enlighten his audience on the optimum cutting speed or the minimum manufacturing cost cutting speed.

Detroit

The Rackham Building was the scene of the October 10 automation meeting, when 125 members heard A. B. Riddiford, Jr., chief engineer on hydraulics, John S. Barnes Corporation, talk on "The Rhythm of Production." Mr. Riddiford enlarged upon the fundamental importance of hydraulic controls and actuations in the design, functions, modes of operation and manufacture of automatic process through machines. His talk was supplemented by colored slides illustrating the points made.

Grand River Valley

A lecture on higher education was given at the November 1 meeting by J. G. Hagey, president of Waterloo College. Following the lecture, a committee was appointed to handle nominations for next year's chapter officers.

Dayton

On October 9 over 100 members of the ASTE and ASM at a combination dinner meeting at the Engineers Club, heard Leo P. Tarasov, head of Research and Development Department, Norton Company, speak on "Some Results of Grinding Research." Dr. Tarasov enlarged upon the nature of grinding processes; factors affecting the grindability of tool steels and other materials; effects of grinding upon the surface condition and the fatigue properties of hardened steels; and trouble-shooting methods.

Des Moines

Approximately 100 members and wives were in attendance at the Des Moines Golf and Country Club for the October 10 Ladies Night. Following the smorgasbord dinner, Past Chairman Howard F. Campbell, G. Fred McMaster, John Hug and Thomas H. Houke were presented with rosewood gavels with silver bands displaying years of service. Earl Volkamer, program chairman, presented Mrs. Robert Van Horn of Van Horn Plastics Corporation, who gave an informative talk on plastics and their uses.

Evansville

A technical talk, accompanied by panel displays and color slides on "The Story of Measurement" by C. G. Shelly, managing director of the Wilkie Foundation, was given at the chapter's annual Executives Night meeting. Past President Howard McMillen and Harvey Bower, chairman of the Evansville-Owensboro section of ASQC, and several ASQC members were present.

Fort Wayne

Speaker for the October 10 meeting at Hobby Ranch House was Lynn Williams, president of Autocut Engineering Company, who presented an interesting coverage of electrolytic grinding.

Grand Rapids

Jack Manting, president of Hanchett Magnalok Corporation, Big Rapids, gave an interesting talk on "Magnetic Chucks" at the October 14 meeting held at Varsity Grill in Grand Rapids.

Chips and Chatter

RACINE—Among twenty-year members honored at a recent chapter meeting with the presentation of travel clocks are, front left: H. N. Christensen, John Shipley, Herb Falkenrath, L. E. Phelps, and E. Moxness. Standing are Harry E. Coshun, E. J. Sadowski, Clifford Dupuis, and C. J. Schweitzer. —*James Thoemke*

Golden Gate

Golden Gate members were the guests of Captain Fahy during their recent visit to hundred-year-old Mare Island Shipyard. H. L. Graybeal, head engineer of the Design Division, spoke to the group at length on the problems arising out of the launching of the first nuclear submarine built on the West Coast. Among them were a re-education of personnel to basic methods, made necessary by the high inspection standards. An example of tightening down on the specifications was given for the reactor piping, formerly requiring zero leakage, but now required to conform to one cc per hundred years.

Mr. Graybeal showed colored slides and described the general layout of a nuclear submarine power plant.

Hartford

Otto R. Winter, Beardsley & Piper Division of Tettibone Mulliken Corporation, spoke to members on "Shell Molding" at the November 4 meeting. His speech was followed by slides and movies.

The Hedges was the scene of the October 7 program featuring J. James Mudd, manager of field engineers and sales of The Bellows Company. Mr. Mudd, with 20 years' experience in the industrial application of air-powered equipment, spoke on "Operation Push-button," showing how shops and plants of all sizes have used controlled air-power to set amazing cost saving records.

Greater New York

Approximately 100 members and guests viewed slides on production procedures and the machines used in Flo Turning process, shown by Arthur A. Merry, chief of advanced tool engineering, Pratt & Whitney Aircraft Division of United Aircraft Company, at the October meeting, Hotel New Yorker. The presentation was followed by an active question and answer session between audience and speaker.

Kansas City

On October 1, Kansas City members were guests of the First Midwest Machine Tool Show sponsored by the Ellfeldt Machinery Company. Over 40 manufacturers and 100 machines were represented, with all tools in power and representatives available for questions.

Lieutenant Paul Stahl of the Kansas City Police Department was the speaker at the October 16 Ladies Night. He spoke on the safeguard of the home, the necessary precautions against intruders and the necessity of calling police in case of disturbance. He demonstrated Judo and the use of firearms.

Little Rock

On October 10 at Hank's Dog House, members participated in a discussion following a talk by Mr. Currie of The Carborundum Company. His talk covered the production and selection of various grades of grinding wheels for typical production operation.

Keystone

The October 21 dinner meeting was held at Castle Restaurant with Edward K. Lofberg as the featured speaker. His presentation on "Peculiarities of Glass" was based on five subtopics; (1) types of glass; (2) properties of glass; (3) methods of processing; (4) design of glass shapes; and (5) new developments. Discussion was held relative to possible manufacturing and machine methods for pyronceram—a shockproof and heat-resistant glass considered for rocket noses as well as for the leading edges of air foils.

Little Rhody

Lloyd Sheeran, educational chairman, gave a welcoming address and presented pins to the new student members at the dinner meeting held at Johnson's Hummocks Restaurant October 24.

Mississippi

"Coated Abrasives in Metalworking Industry" was the subject presented by James L. Rice, product engineer, at the October meeting at the Edwards Hotel. Thirty members saw a film showing unusual applications of coated abrasives in industrial plants. Mr. Rice talked on coolants that can be used to increase the life of coated abrasives and make better finishes on oarts; he also suggested wheels to use to absorb heat.

A tour of Le Tourneous offshore oil rig was made by members November 11.

Monadnock

A tour by Monadnock members of the very modern Markem Machine Company plant in Keene, New Hampshire, included visits to the departments concerned with sales, engineering, printing machine manufacture, cut engraving and molding of type for printing, research and development, assembly and inspection.

An associate company, the F. A. Putnam Manufacturing Company, makes the inks, which, together with the printing equipment, can print on anything from thin glass vials to plastic squeeze bottles. Standard machines are adapted to each job by the use of special fixtures, many completely automatic. The groups saw several of the finished machine in operation.

Mid-Hudson

Chairman Harry Keller welcomed the members to the Annual Kingston Night of the Mid-Hudson chapter.

Speaker William D. McAllister, staff engineer at the Federal Bearings Company, Inc., presented a talk on ball bearings, past, present and future. Mr. McAllister outlined the past history of ball bearings, the problems of standardization of dimensions and load ratings. He also spoke of present-day bearings and the effort being expended to increase their life.

Coffee speaker was John L. Daniels, account executive of Merrill, Lynch, Pierce, Fenner and Beane, whose topic was "Common Stock Today." He outlined a savings program through common stock to insure an adequate income to retire on.

Milwaukee

On October 10, 125 members enjoyed a plant tour of the Briggs & Stratton Corporation, one of the world's largest producers of small gasoline engines.

Monmouth

At the October meeting Monmouth members enjoyed talks by Earl R. Mohr, president of Storms Drop Forging Company; and Edward W. Connelly, sales manager, Production Pattern and Foundry Company. Mr. Mohr spoke on "Forging in Closed Dies." Mr. Connelly on "The Shell Molding Process." Excellent color and sound films of both processes, plus a comprehensive display of sample products, added interest to the presentations.

Northern Massachusetts

One hundred members heard Warren R. Purcell, industrial consultant, Rath & Strong, Inc., speak at the October meeting at U.T.D. Company Recreation Hall. The speaker's subject, "Quality Control Procedures," described the process control and inspection procedures which major industry has adopted in order to eliminate the often wasteful traditional procedures. The extent to which modern quality control techinques can be applied is exemplified by the fact that the U. S. Air Force accepts jet planes on a quality control basis.

Pittsburgh

On November 1 the final session of the third annual education series, which covered grinding and grinding wheels, was held under the chairmanship of Walter E. Baker, chairman of education committee. The program included a talk on the future of grinding by Boyd H. Work, consultant, Grinding Wheel Institute, and was accompanied by a 30-minute film on various grinding applications. The film was followed by a general panel discussion, taking up questions that had been presented throughout the previous four lectures.

Paterson

Robert G. Strother, Eastern regional manager of Magnaflux Corporation outlined for Paterson's recent meeting the new methods and tools for nondestructive testing. Procedures he mentioned included magnetic particle, ultrasonic, penetrant and eddy current testing. Following the lecture, members saw a demonstration of new electronic equipment used for flaw detection, thickness measurement and hardness testing.

"Engineering for Production at Picatinny Arsenal" was the title of a talk given by Howard C. Appleman, Chief Applications Engineer Branch, Picatinny Arsenal, at the fiftieth-anniversary meeting held November 5 at Brownstone House. National Director Edmund Hollingsworth reported briefly on national affairs discussed at the Board of Directors' semiannual meeting.

Phoenix

Werner I. Senger, Gisholt Machine Company, Balancing Division, was the speaker at the October 7 meeting. His subject was "Nature of Balancing," followed by a film and a question period.

Pittsburgh

W. L. Budge, sales manager of the Atomic Power Department of Westinghouse Electric Corporation, spoke at the October meeting on "The Growth of Atomic Power and Its Tooling Problems." He gave considerable information on the construction of atomic reactors and their applications, revealing some of the problems involved in building this type of equipment.

Portland, Me.

On November 1 Fred Nevar of Zagar, Inc. spoke on "Design for Multiple Spindle Drilling" with a discussion period following. Other highlights of the meeting were election of nominating committee and advance reports on "Future Apprentice Contest" for next April.

Racine

One-hundred-twenty-five members were present at the technical meeting held October 7 at Dania Hall. Malcolm F. Judkins, director New Products Development, Firth-Sterling, Inc presented a nontechnical summary of nucleonics as used and applied in industry today.

WORCESTER—Chairman John Lalor, left, looks on as Speaker Robert Belmont of Bay State Abrasive points out a chart for grinding wheel markings. At right is Elden Auker, vice president in charge of sales at Bay State. *—Robert A. Cusson*

Rockford

Lafayette Hotel was the meeting place for 100 members who heard William S. Holloway, director of Research and Development, Madison Industries, Inc., present an interesting talk on "Modern Gun Drilling Applications." The outline of Mr. Holloway's speech included the history of deep hole production; construction and cutting characteristics of gun drilling; also speed, feeds, coolant and setup requirements.

Foster A. Smith, chairman, Greater Rockford Airport Authority, spoke on "Rockford Looks at Aviation's Future."

SANTA CLARA—Dr. Lawrence H. Cook is shown as he talked to members at a recent technical meeting on the manufacture and use of diamond tools.

Santa Clara

Fifty-two members at the October 15 meeting at Old Plantation Inn, Los Altos, enjoyed hearing Lawrence H. Cook, owner-manager of Cook Research Laboratories, speak on "The Manufacture and Use of Diamond Tools." Dr. Cook's talk included a diagram showing where diamonds are found, how they are cut for jewels, how they are sold, and what is being done by people who handle diamonds to expand their usage.

South Bend

"A Method of Reasoning for Tool Design" was the subject of a talk given by J. J. Karash, tool engineer of the Plant Planning Department, Reliance Electric & Engineering Company, for a recent technical meeting. The talk, which was illustrated with appropriate slides, was presented in a humorous and entertaining style. A colored film on trout fishing in Canada, furnished by South Bend Tackle Company, was shown as an after-dinner feature.

Springfield, Mass.

Members numbering 186 attended the annual steak roast, held at the base of the Berkshires. Thomas Ruddeforth, chairman of the arrangements committee, presented a large assortment of door prizes, and Chapter Chairman Robert Marquiss greeted invited guests from the Hartford chapter.

Wayside Inn was the meeting place for 60 members at the October technical meeting. A moving picture was shown by Edward Janiszewski, branch manager, Superior Steel Products Corporation. It showed the use of die sets on the job and the manufacturing processes used to produce precision die sets. This was followed by an interesting question and answer period and discussion of many existing problems.

Saginaw Valley

C. M. Adams, Electric Auto-Lite Company vice president and general manager of the Bay City Division, welcomed Bay City tool engineers to a tour of the plant, giving them a preliminary thumbnail sketch of the plant.

On tour, members observed the fabrication of auto body hardware and trim, as well as production of many colorful plastic products. Carefully chosen guides insured guests of a profitable evening by highlighting the special points of interest. In viewing materials finishing methods, techniques and equipment, the visitors were made aware of the tool engineer's services in the area of making products attractive.

San Antonio

At the October 9 technical meeting held at Youngblood's, "Modern Methods of Hole Punching and Notching" was the subject of discussion given by Norman F. Weyland, division manager, Midwest, Wales-Strippit Company, and his asociate, J. R. Lemon. A series of slides was shown illustrating the flexibility of the use of their company's self-stripping dies.

Twin States

Malcolm Judkins of Firth-Sterling, Inc., gave a talk on "Latest Carbide Developments" at the October meeting. A lively question and answer period on high-temperature alloys followed.

Trenton-Delaware Valley

On October 21, members participated in a discussion concerning heat treating of various tool steels and heard George Schad, chief metallurgist, The Carpenter Steel Company, speak on the proper selection of steel for molds and dies, and four ways to better tooling.

Wichita

Full description of chem-milling, with slides and sample parts, was given at the October meeting when Bob Samuelson, chief chemist, Beech Aircraft Corporation, was the speaker.

Western Reserve

At the October 22 technical meeting, members heard J. R. Workman, sales manager, Metal Carbides Corporation, give a brief history of his company, followed by a slide film of talide metal uses. A panel of five metal carbides engineers, with a total of 75 years' experience in carbides, conducted a question and answer period.

WESTERN RESERVE—Speaker J. R. Workman, center, sales manager, Metal Carbides Corporation, is shown with, from left: Ed McCabe, chapter chairman; G. Gay, and C. Banner sintering, foreman, and production manager respectively, of Metal Carbides Corporation.

Worcester

"Unique Carbide Applications and Processes" was the title of a talk given by Jerome F. Kuzmick, president, Welded Carbide Tool Company at the October 14 meeting. This was a joint meeting with the Worcester chapter of the Society of Carbide Engineers, with ASTE members as their guests.

chapter news and views

Windsor Maps Plans For Technical Training

T. C. White, Director of Education for Windsor, Canada, addressed the recent meeting of that Canadian chapter. Distinguished guests at the meeting included the Windsor Education Council, the Western Ontario Institute of Technology Promotion Committee, and other Canadian educational interests.

Mr. White's talk centered around the need for an additional intermediate level of education on the engineering technician level. Comparisons of our educational system and that of Russia were drawn, pointing out that Russia is training a large number of technicians to fill a gap between the tradesman and the engineer. The establishment of a new Institute of Technology in Windsor in the fall of 1958 is expected to fill a great need for such training in this area, Mr. White stated.

—J. H. Kirkwood

Lansing Fathers, Sons Tour Cereal Manufacturer

Transformation of whole corn into the ever-popular cornflake held the attention of Lansing fathers and their male offspring at a Father and Son Night plant tour of the Kellogg Company's Cornflake Division. The trip took the visitors through the print shop and papers storage, prior to viewing the processing of whole corn into corn particles, and their subsequent pressure cooking, flavoring, flattening by rolls into flake form, oven baking, and final spray with vitamins. The last step in production is the packaging, done completely automatically.

Final treat came when the boys received "beany" hat kits and were treated to ice cream-topped sugar corn pops.

—R. J. Krumrie

Carbide Night Features Election Extra

PHILADELPHIA—Carbide Night speakers who dealt with "Machining for the Jet Age" were, from left: George Foster, Standard Pressed Steel; Bob Schwing, on Philly's carbide committee; Frank Opila of Westinghouse; Ray Wiren, also carbide committee; and William Montgomery of Firth-Sterling Incorporated. *—John Chernokreluk*

Materials for the jet age have introduced new machining problems for the tool engineer. Led by Moderator George Foster, carbide engineer, Standard Pressed Steel Company, speakers on the Carbide Night program at Philadelphia, showed that carbide technology has kept pace with the new demands. An added feature of this meeting was the election of Harold Fullman and Walter Demaris as first and second vice chairman, respectively. This election was made necessary by the resignation of William Chafont who had been first vice chairman.

High-temperature alloys, as described by William Montgomery, chief engineer, Firth-Sterling, have high structural strength at high temperature. This characteristic is a good design quality but causes no joy in the shop. To overcome the high shear strength of such alloys, a machine tool must have sufficient power and rigidity built in.

Alloys should be solution heat treated before machining and, because of abrasiveness, the hardest grade of carbide should be used under cutting conditions determined by trial. A single cut is preferable because of surface hardening but a second cut can be taken.

Large chip breakers are helpful because they reduce tool pressure, temperature and built-up edge. Tip breakage can be reduced, when machining high-temperature alloys, if the cutting edge is 30 deg. A honed edge of up to 0.030 inch prevents carbide chipping.

New alloys are also being used in construction of steam turbines, according to reports by Frank Opila, Tool & Design Planning, Westinghouse. Turbine parts that operate at 2700 psi and 1200 F are machined with a Grade C-2 carbide. Roughing is done at 80 fpm and finishing at 100 fpm, both at feeds of 0.007 ipr. Carbide gun drills are used to form 1.5-inch diameter holes six feet long. With these techniques, $3000 was saved per hole in alloys.

Chapter News and Views

CALIFORNIA CHAPTERS—Attending a recent ASTE membership area meeting are, front row, from left: Rudolph Regen, National Public Relations Committee; Larry Pomerantz, National Program Committee; J. H. Medford, Long Beach chairman; Ralph Chrissie, National Membership vice chairman; T. J. Zomborean and Edison Busher, area captains. Behind are Jack Hall and J. B. Cox, Los Angeles membership cochairmen; J. R. Felter, area captain; L. W. Allen, Long Beach membership chairman; Oris Feuling, Riverside membership chairman; Ray Williams, Centinela Valley; and W. J. Shannon, San Fernando membership committeeman. *—Gene Grahn*

GOLDEN GATE—Carlton S. Smith, head of Public Relations, Aeroject-General Corporation, right, who gave a short talk on "The New Age of the Rocket," is shown with, left, Basil Keyes and Chairman Philip R. Freeman. *—Albert V. Swan*

"38,000 Could Be 500,000" At California Regional Membership Meeting

Representatives of chapter and national membership committees in the California area meeting at the Ambassador Hotel in Los Angeles got a two-hour-and-twenty-minute concentrated course in how to sell ASTE to its members—present, potential, and those whose interest needs to be refocused. Long Beach Chairman James Medford stressed the importance of new members, saying that "ASTE has not even scratched the surface of potential membership; 38,000 members could be 500,000 members." Ed Busher, area captain from Riverside, suggested some "sales" points to make to potential members asking "What do you get for your $10.00?" Some of the tangible assets of membership mentioned were THE TOOL ENGINEER magazine, Data Sheets, and eligibility for insurance under the ASTE income protection plan. Less tangible, but perhaps even more important is job security through the continued educational opportunities available through membership, and contacts and association with other tool engineers.

Among other points made were the part played by public relations in following up new contacts, by the cordiality shown them as guests at meetings, and through follow-up letters and continued courtesies. Fine points of filling out membership applications, letting active members know about delinquent members so they can be contacted before their membership lapses, and plant domination of a chapter were also among topics discussed at this "short course in selling ASTE."

Carl Oxford, Jr. Speaks To Varied Audiences

Speaking on the subject, "Modern Drills and Drilling Techniques," National Twist Drill's research director, Carl Oxford, Jr., has been on a tour of chapters and larger groups, including the Bradley University On-Campus Conference, recently held in Peoria, Illinois. Mr. Oxford appeared before members of the following California chapters: Santa Ana, San Gabriel, San Fernando, San Diego, Los Angeles, and Oakland County, Pontiac, Michigan.

An historical recounting of the slow progress in drill design, starting with early Egyptian applications, traces its development through the Roman era and later periods. Major changes were made from early American times to the present, Mr. Oxford announced.

SAN FERNANDO VALLEY—Touring Speaker Carl Oxford, Jr., member of Detroit chapter and the National Education Committee, is congratulated by Chairman Bob Broomell after his recent presentation, "Modern Drills and Drilling Techniques." Mr. Oxford, director of research at National Twist Drill and Tool Co., is shown here with his assistants, Woody Wilson and Bob Wardlow. *—R. E. Ditrick*

New York Active in Educational Field

Greater New York is very proud of its achievement in the field of education. The course on automation given at New York University was one of the chapter's best efforts in this activity. In cooperation with New York University, the chapter organized the course for the spring semester of 1957. Attending the course were engineers and other production personnel representing the best-known firms in the vicinity. Many of the students had their fees paid by firms, and some traveled distances of 100 miles or more. The lecturers were all specialists in their particular fields. Among these were: A. H. Kuhnel, chief engineer, Special Devices Division, The Austin Company; Dr. Joseph Seton Smith, assistant chief development engineer, Control Instrument Company; Dr. George T. Hunter, Applied Science Division, International Business Machines, Incorporated; H. S. Cadieux, New York District manager, The Bellows Company; A. E. Stehle, chief engineer, Ettco Tool & Machine Company, Incorporated; W. McKinsey, Jr., development engineer, Syntron Co.

An interesting feature of the course is the fact that a portion of the fees collected by New York University is now set aside for ASTE sponsored scholarships. Greater New York chapter, in conjunction with the University, has now scheduled for the 1957 fall term and 1958 spring term the following courses: time study, quality control, tool design, engineering and manufacturing processes, automatic production with pneumatic and hydraulic mechanisms, product design, plant planning and layout, and automatic problem by electronic controls. —*Alfred Sampter*

HOUSTON—At the technical meeting of October 8, W. L. Kennecott, vice president of Kennametal, Inc., spoke on how to analyze and correct carbide tool breakdowns. National President H. E. Collins, shown at right, gave a short talk on the Hannover Machine Tool Show. Shown with him are, left to right, Jerry L. Stanley, owner, Jerry A. Stanley Tool Company; Tony Mann, machine tool analyst, W-K-M Division, ACF Industries; and A. F. Huge, Jr., president of August F. Huge & Sons. —*A. G. Kane*

Janet Lofting Vacates News Department Post

Janet Lofting, who has been ASTE News Editor of THE TOOL ENGINEER for the past twelve months, recently resigned her position to move to another city. Mrs. Lofting covered both chapter and national ASTE activities in her capacity as news editor. She attended several eastern regional meetings, the Silver Anniversary Meeting in Houston, and the 1956 Semiannual Meeting, in addition to various conferences.

Prior to her association with THE TOOL ENGINEER, Mrs. Lofting was employed as editorial assistant for the Institute of Radio Engineers' publications.

New Haven Members Hear Motors Expert

A turnout of 60 members of New Haven chapter greeted Theodore D. O'Connor, plant superintendent of the U. S. Motors Milford, Connecticut plant, at a recent meeting. Mr. O'Connor, in giving some historical background about the company, one of the most diversified manufacturers of electrical motors in this country, stated that it was the first to introduce across-the-line starting and to install ball bearings as standard equipment.

During World War II, he disclosed, it became active in the production of lightweight 400-cycle aircraft motors. By maintaining a concentrated, well-directed research program, it has solved many difficult industrial problems such as explosion-proof immersible motors for fuel pump applications.

Following the talk, "members only" toured the Milford plant.—*B. Didsbury*

BINGHAMTON—Chapter Program Chairman John Maruca, left, and Vice Chairman Charles King, right, pose with Donald E. Oberg, general manager of Oberg Manufacturing Company, who spoke to the chapter on applications, advantages and limitations of carbide dies. The talk was illustrated by 3-D slides of carbide punch press dies. —*Joseph Pokorak*

ERIE—Chairman H. W. Sedler, and Lyle Gray and Robert Shilling, chief engineer and office manager of Molded Fiber Glass Boat Company, look over the hull of a 16-foot model during the chapter's tour of the plant. One-piece hulls are of fiber glass and polyester resin molded in a hydraulic press using male and female dies. —*Leo B. Weiner*

Coming Meetings

National

ASTE Tool Show and 26th Annual Meeting, May 1 through 8, at Philadelphia. Tool Show at Philadelphia's Convention Center.

CHICAGO AREA Ceramic Tool Seminar, Dec. 12, Hotel Morrison, Chicago.

Chapter

AKRON—Dec. 6, 9 p.m., The Firestone Country Club. Annual Christmas party.

BIRMINGHAM—Dec. 13, 8 p.m., Vestavia Gardens Club, Homewood. Dinner and annual Christmas party.

BOSTON—Dec. 12, "Automation in Optical Projection," E. C. Polidor, Automation Gages, Inc.

CENTRAL PENNSYLVANIA—Dec. 4, Executives Night. Speaker, ASTE National President H. E. Collins.

CHICAGO—Dec. 9, 7 p.m., Nielsen's Restaurant. Annual Ladies Night and Christmas party.

DENVER—Dec. 11, 6:45 p.m., American Legion Post No. 1. Speaker, Don L. Davis, president, Invention Industry Association. Ladies Night.

ELMIRA—Dec. 2, 6:30 p.m., Mark Twain Hotel. Dinner and plant tour of Hardinge Bros.

ERIE—Dec. 3, 6:30 p.m., Polish Falcons Club. "Carbides" by Malcolm Judkins, director, New Products Div., Firth-Sterling, Inc.

GOLDEN GATE—Dec. 6, 8 p.m., Leamington Hotel. Annual Christmas party and social evening. John Weegan in charge of arrangements.

GREATER NEW YORK—Dec. 2, 8 p.m., Hotel New Yorker. Panel discussion on "Tolerance Charts and Processing." Panel chairman, Julius Schoen, proprietor and chief engineer, Arista Designing & Process Corp.

HARTFORD—Dec. 2. "Reasoning and Tool Design."

INDIANAPOLIS—Dec. 12, 7:30 p.m., Antlers Hotel - Gold Room. Ladies Night, dinner and dance party.

KANSAS CITY—Dec. 18, 7 p.m. Plant tour of Union Wire Rope Corp.

KOKOMO—Dec. 12, 6:30 p.m., American Legion Home. "Techniques of Surface Grinding" by John A. Harrington, chief engineer, DoAll Co.

LANSING—Dec. 13, Lansing Civic Center. Speaker from Corning Glass Works. Ladies Night.

LONG BEACH—Dec. 11, 8 p.m., The Petroleum Club. "That Magic Box, Your Television" by Clarence Crary, associated with color television. Coffee talk.

LOS ANGELES—Dec. 6, Sportsman Lodge, North Hollywood. Annual Christmas dinner dance.

MACOMB—Dec. 5, 6:30 p.m., Roma Hall of East Detroit. Semitechnical meeting and first anniversary party.

MANSFIELD—Dec. 12, 7:30 p.m., Baku Grotto Hall. Christmas dinner dance for members and guests. Dec. 5, plant tour of the Electric Div. of Westinghouse. Meet in plant auditorium. Talk by company official followed by dinner.

MERRIMACK VALLEY—Dec. 5, 6:45 p.m., Andover Country Club. "Jig Boring and Precision Measurement" by representative of American Sip Corp.

MILWAUKEE—Dec. 12, 6:30 p.m., American Serb Memorial Hall. "Deep Drawing Operations and Presses" by W. S. Wagner, chief development engineer. Sound film and colored slides on the subject.

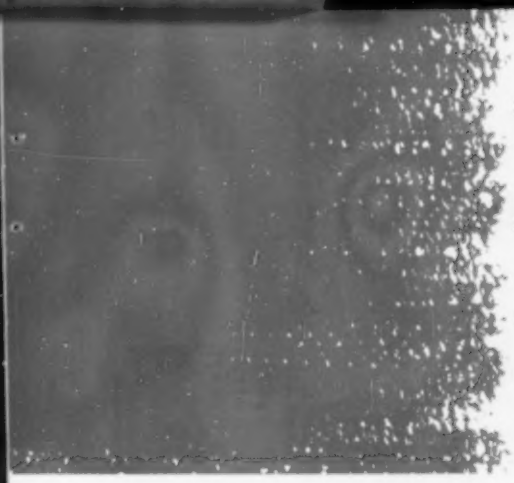
MISSISSIPPI—Dec. 9, Edwards Hotel, Coronet Room. Dinner, 7; meeting 8 p.m. "Tooling for Induction Heating" by Dr. Harry B. Osborn, technical director, Tocco Div., Ohio Crankshaft Co.

MONADNOCK—Dec. 7, 7 p.m., American Legion Hall. Ladies Night, dinner and dance.

MUSKEGON—Dec. 10, 7 p.m., plant tour of Misco Precision Casting Co.

NEW HAVEN—Dec. 12, 6:30 p.m., The New Haven Country Club. Ladies Night and Chirstmas party. Social hour will precede dinner. Dancing.

NORTHEAST PENNSYLVANIA—Dec. 9, 7 p.m., Bonnie's Restaurant, West Pittston. 8 p.m., plant tour of Atlas Chain Works.



NORTHERN MASSACHUSETTS—Dec. 10, 7 p.m., Union Twist Drill Co. Recreation Hall. "Metal Removal with Carbides" by Malcolm Judkins, director, New Products Div., Firth Sterling Steel & Carbide Corp.

NORTHWESTERN PENNSYLVANIA—Dec. 5, 6:30 p.m., American Legion Club. "Bell Solar Battery" by Harold A. Byron, supervisor, customer information, Bell Telephone Co.

OKLAHOMA CITY—Dec. 3, 6:30 p.m., Boulevard Cafeteria. "Tooling for Optimation" by Harry Conn, chief engineer, Scully-Jones & Co.

OZARK—Dec. 19, 7 p.m., place to be announced. Chapter barbecue and social.

PEORIA—Dec. 3, 6:30 p.m., Vonachen's Junction. "The Art of Compressing Speech" by W. Everitt, Dean of College of Engineering, University of Illinois. Program arranged and conducted by Student Branch of Peoria chapter.

PHILADELPHIA—Dec. 19, 6:30 p.m., Penn-Sherwood Hotel. Annual Christmas party.

PHOENIX—Dec. 9, 7 p.m., Westward Ho Hotel. Social dinner and entertainment for members and wives.

PORTLAND, ME.—Dec. 6, 7 p.m., Falmouth Hotel. "Plastic Steel" by Richard L. Revere, sales engineer for Devcon Corp. Third annual Father and Son Night.

ROCKFORD—Dec. 12, 7 p.m., Forest Hills Country Club. Ladies Night, dinner dance.

SACRAMENTO—Dec. 7, 7:30 p.m. for social hour, 8 p.m. for dinner preceding meeting. Capitol Inn, West Sacramento. Ladies night program.

SAGINAW VALLEY—Dec. 7, 7 p.m., Zehnder's Hotel. Christmas party, dinner, dance, entertainment.

SANTA CLARA VALLEY—Dec. 10, 6:30 p.m., International Business Machines San Jose plant. "Plastic Tooling for Small Plants" by Walter J. Arrufat, Manufacturing Engineer Div., IBM.

SCHUYLKILL VALLEY—Dec. 10, 6:30 p.m., Berkshire Hotel, Reading. "Industrial Plastics Applications" by Kenneth G. Harms, technical service manager, Polymer Corp.

SOUTHEAST KANSAS—Dec. 5, Economics of Tooling and Manufacturing" by Harry Conn, Scully Jones & Co.

ST. LOUIS—Dec. 1, 6:30 p.m., Kingsway Hotel. "Ransburg Elec'rocoating Process - How, When and Where?" by Emery T. Miller. Dec. 14, Annual Christmas party, Coronado Hotel.

TOLEDO—Dec. 11, 7 p.m., Maumee River Yacht Club. "Numatic Controls" by George Doig, sales manager, Numatics, Inc.

TRENTON-DELAWARE—Dec. 16, 6:30 p.m., Jerry Cahill's Restaurant. Annual Christmas party. Dining, dancing and professional entertainment.

TRI-CITIES—Dec. 7, 6:30 p.m., Johnny Hartman's Restaurant on the Mississippi. Ladies Night. Banquet and dinner music. Stage show, featuring radio and TV talent. Gifts and dancing.

TWIN CITIES—Dec. 4, 6:30 p.m., "Coleman's" at Hyland Park. "Tape Control of Machine Tools" by W. S. Tandler, president, Warner & Swasey.

WINDSOR—Dec. 9, 7:30 p.m., Prince Edward Hotel. "Principles of Spline Rolling" by Richard S. Hildreth, chief engineer, Michigan Tool Co.

WORCESTER—Dec. 7, 8 p.m., Putnam & Thurston's. Ladies Night, Christmas party, dinner and dance.

Obituaries

Well Known Hartford Tool Figure Dies at 82

Clayton Burt, senior member of ASTE's Hartford chapter and a widely known figure in the machine tool industry, died recently in Hartford, Connecticut at the age of 82. A past president of the National Machine Tool Builders Association, Mr. Burt had long been associated with Pratt & Whitney Company, Incorporated before his retirement.

He was president of the company when it was still known as the Pratt & Whitney Division of Niles Bement Pond Company, and subsequently became president of Potter and Johnson, when it was bought out by Pratt & Whitney.

Other members of ASTE who passed on recently were **Richard E. Coleman**, Long Island chapter, assistant foreman at Republic Aviation Corporation; and **Theodore Raymond Trowbridge** of Peoria, staff engineer with Caterpillar Tractor Company.

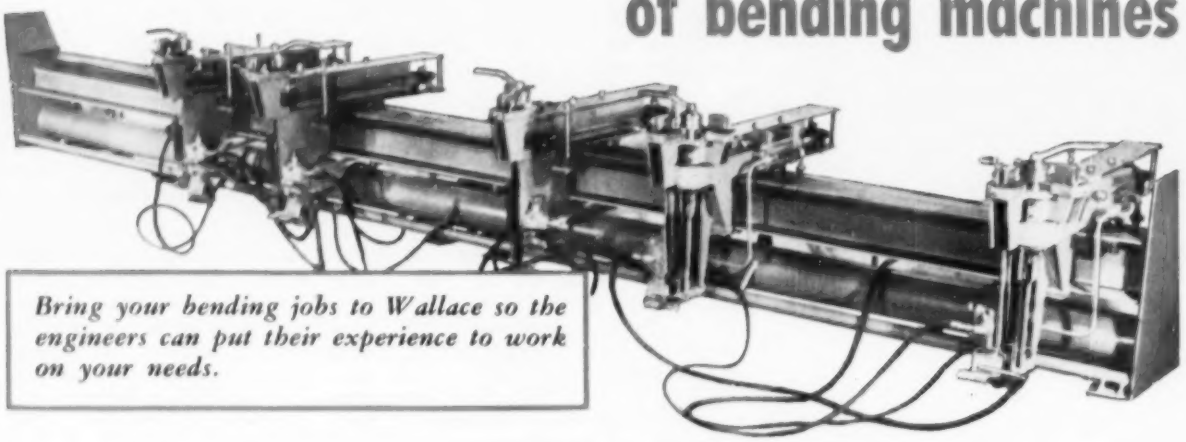
Position Wanted

AVAILABLE PLANT MANAGER small plant operation in Detroit area preferred. Wide experience in the design and build of special operation machinery, automated material handling equipment and tooling. Experienced in all departments from sales contact through design and build. All replies on company letterhead answered in confidence. For resume or appointment, write to Box 107, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Michigan.

Tooling Text List now available

A bibliography of textual and reference books on tool engineering subjects has been compiled by the National Education Committee of ASTE, and is now available on request without charge from Headquarters, 10700 Puritan Avenue, Detroit 38, Mich.

WALLACE offers the World's largest choice of bending machines



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One of the world's largest makers of automobile cushions wanted a machine to bend 21-flat border wires each with 5 bends. The Wallace #1000 bender was developed for them. With it they were able to produce these parts at the rate of 5,565 bends per hour. Since then each of their new plants receives a #1000. Your work may not be related in any way to border wire bending. However, the vast store of knowledge developed by us since our founding in 1896 is at your service.

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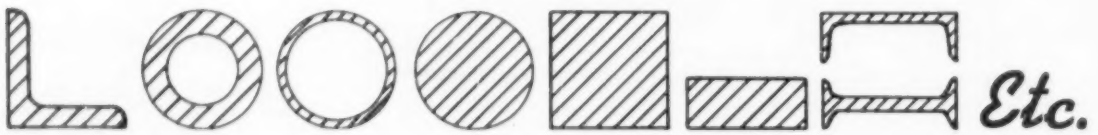
If your shop does either bending or cutting of these forms of metal . . .



You or your firm should have a copy of this book for reference.

1957 Edition — Manual of Processes for the Cold Bending of Metals and Abrasive Cut-Machining of Metals.

This authoritative book is now in 65 public libraries. Universities in 20 states and 19 foreign countries.

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PROGRESS IN PRODUCTION

WELDING STUDY MAY LOWER INSPECTION COSTS

Results of a research project pursued by the Department of Welding Engineering at the Ohio State University indicate that cost of welding inspection now carried out by industry could be appreciably reduced. At present costs of testing and inspecting often required by code to be done with elaborate equipment, frequently equals, or may even exceed, cost of making the welds. Investigation of the effects of porosity in welds has established facts which could be used in place of presently required inspection to locate and measure porosity in welds.

Welds subjected to study were made under controlled conditions with automatic submerged arc and inert gas processes so as to create porosity in welds. A series of tensile, bend and impact tests were made on the butt welds which were in ½-in. thick mild steel. Experimenting was conducted only on welds machined flat from the ½-in. thickness of the plate.

According to the tests, the welds could contain porosity amounting in total volume to a void equal to 7 percent of the cross section of the weld without materially changing the tensile or impact strength and ductility of the welds. Because most welds are made with a build-up that increases the cross section of the weld, the researchers note that the 7 percent figure actually will be larger for welds made with normal procedures.

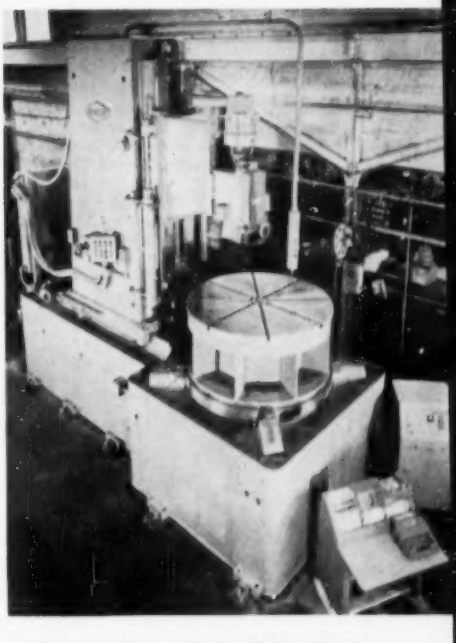
Shape and distribution pattern of the porosity was discovered to have little or no effect on the test results. A small amount of porosity is generally accepted by current inspection standards. However, since results of the Ohio State University tests show that as much as 7 percent reduction of the cross section has little or no effect on weld strength, researchers note that a re-evaluation of inspection standards is indicated.

Tests were conducted under direction of William Green and Roy McCauley of the university's Welding Engineering Dept. and will be reported before the American Welding Society next spring.

ELECTRONICS CONTROLS SPECIAL DRILLING TOOL

Holes on circle diameters from 0 to 60 in. are drilled by this special vertical hydraulic feed single spindle drill press with a horizontal index table. The index table is electronically controlled with more than 300,000 positions from any starting point position. Accuracy of the index table is within 0.002 in. measured on a 24-in. radius from the center of rotation.

Automatic operation of the index is through a standard I.B.M. punch card system. When the drill cycle is complete, the next card calls for a new table position. This sequence is repeated until all the cards have been run through the reader. Proper punching of the cards serves to obtain any pattern of hole spacing. Head traverse and feed rate are controlled by regulating the hydraulic power supply.



The machine, built by Baker Brothers, Inc. for a jet engine manufacturer, has an infinitely adjustable spindle speed between 60 and 3,000 rpm. The spindle develops 2 hp at 60 rpm, and approximately 3 hp at 3,000 rpm.

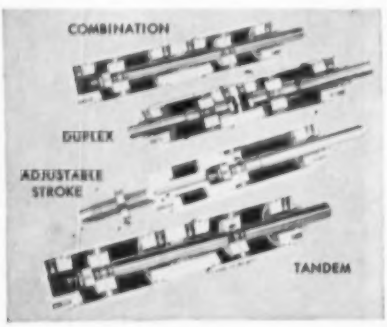
MAN MADE RAINBOW HELPS ANALYZE STEEL

While steel is still molten in the furnace, analysis is being made at Forging & Casting Div. of Allegheny Ludlum Steel Corp. through a direct reading spectrometer installed and calibrated by Baird Associates.

Analysis of heats is accurate, simple and fast. A small sample is spooned from the furnace, poured into a mold

O-M DESIGN assures maximum VERSATILITY

The O-M Internal key-type cylinders are not only the most compact, streamlined and efficient cylinders on the market today; but they also easily lend themselves to modification. Using a majority of standard parts and one or two semi-standard parts, you get the advantages of "special" cylinders designed to do your job better at a very nominal extra over standard cylinder prices. Here are only a few of the combinations available.



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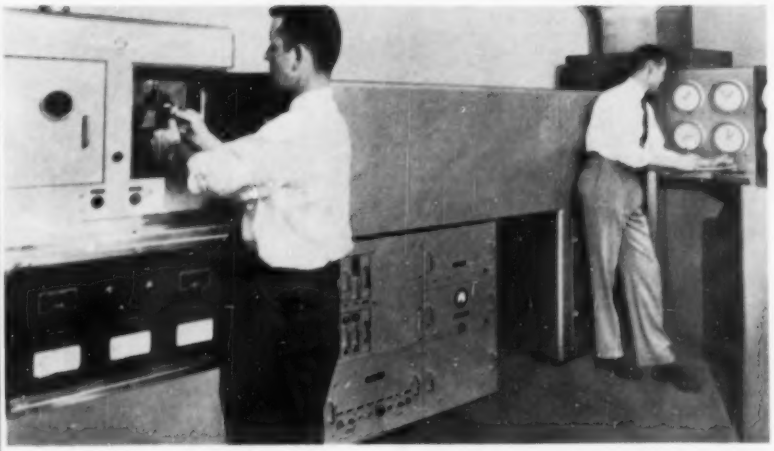


J. G. Vantine, spectrographer, and W. D. Edsall, chief plant metallurgist at Forging & Casting, check results of the spectrometer. A ten element analysis is ascertained by the equipment in 80 seconds.

and rushed to the laboratory. The sample is placed in the instrument, and in 80 sec the analysis of ten elements is recorded. Only eight minutes elapses from the time the sample is spooned into the mold until the analysis is reported to the melt department. As a result of such speed, the desired analysis can be ascertained before a heat is tapped.

In the spectrometer light is created by sparking an electrode against a sample. The light passes through a prism and is broken into a rainbow, parts of which represent certain elements in the sample. These parts are then passed through slits onto vacuum tubes which record the light's brightness. Amount of the element present, determines the brightness. The vacuum tubes transform the light into electrical energy, which is amplified and then recorded as the percentage of the element present.

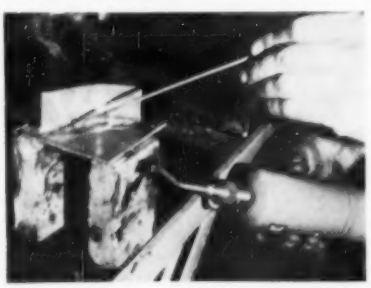
At Forging & Casting, the melt sheets call for 34 different alloys covering the range from iron through tool steels and up to some grades of stainless. Because of the large number of heats cast, and the time necessary to perform normal analytical tests it formerly was difficult for the chemistry laboratory to keep pace with the melting department—a situation corrected by the spectrometer.

METALS JOIN CHEMICALLY THROUGH NEW TECHNIQUE

Similar and dissimilar nonferrous metals are being joined chemically through an industrial technique developed by Intertectics, Inc. Used for the process is a special material, called InterAct, which forms a permanent chemical bond through ion exchange between such materials as magnesium, titanium, brass, zinc, silver and gold. Ordinarily, the resultant joint is stronger than either of the metals involved. It also is reported to frequently be greater in corrosion resistance, and has similar electrical, physical and chemical properties.

Chemically the joining material is classified as a reaction eutectic; a material which, under the influence of heat, eliminates surface oxide layer and causes similar and dissimilar metals to flow together at temperatures lower than the melting point of either metal being used. Joints formed by the new technique cannot be classified as soldered, welded or brazed.

At present the joining material is



Two thick pieces of aluminum are permanently joined simply by heating them to the reaction temperature and applying InterAct wire at the joining points.

available in three forms: $\frac{1}{8}$ in. diam wire wound in coils for T, butt and other exposed type joints; in powder form for joining broader areas of contact; and in granular form for joining foils and other materials where large surfaces are to be brought together at temperatures lower than those available with the use of other forms.

The material, which lends itself

easily to automated industrial conveyor techniques, can be used in three basic methods.

Manual operation involved feeding InterAct wire into the joint wich is heated by a torch. Once reaction temperature has been reached, about two seconds are required to complete the reaction. Fluxing with warm water removes reaction by-products. Under these conditions, the operator must be masked because the material is toxic to skin and lungs.

In conveyor operation, the materials to be joined are moved on a conveyor through an induction furnace or gas oven, heated to approximately 810 F. The joining substance, formed in $\frac{1}{8}$-in. diameters to fit standard welding guns, is fed through a mechanized gun to the joint. Reaction is immediate, and a water spray cleans the joint. A hooded exhaust system is required to vent the fumes. A spray in the tower renders the water soluble fumes harmless.

Third technique is similar to the second except that only the areas to be joined are heated through electric strip heaters. This method lends itself to preforming of wire coils to fit unusually shaped joints. Preformed coils can be dropped automatically into place on the joint in a conveyor type operation.

ALUMINUM INVESTMENTS GAIN ASSURED QUALITIES

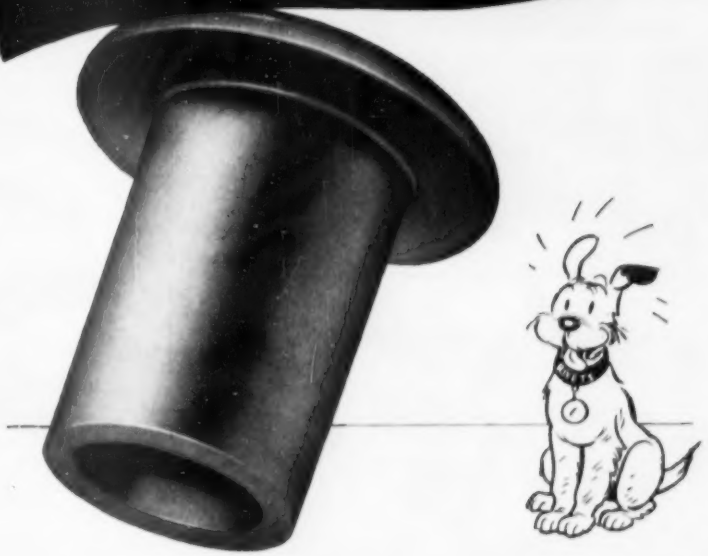
Casting techniques developed by Arwood Precision Casting Corp. are reported to produce investment castings with guaranteed characteristics. Tests of castings made through the new process, show tensile strength of 34,000 psi, yield strength of 25,000 psi and elongation of only 3 percent in all areas of the casting. As compared to these figures, the Aeronautical Material Specification 4260 calls for tensile strength of 24,750 psi, yield strength of 16,500 psi and elongation of 0.7 percent.

With the innovation of this Suparcast process, it appears possible to utilize castings where they were previously impractical or impossible because of their mechanical properties limitations. Now added properties of strength and ductility permit their use as structural, load-carrying parts subject to shock and impact. A special point of these castings is that they are sounder in their thicker sections.

For lost wax investment casting an assembly of wax patterns is dipped into a ceramic slurry which will harden into a smooth shell around the wax. Then, when the wax is melted out and molten metal is poured in, the result is an investment casting. It is to this type of casting that the Arwood development has added reliable qualities.

Back of a *Chicago Rivet*

Is an Organization That Really Serves



The *RIGHT* rivet, plus the *RIGHT* riveting machine will produce a fastened assembly at the *RIGHT* low cost

The correct combination of rivet and machine requires expert knowledge available to you through Chicago Rivet engineers.

Anticipated production, type of materials to be fastened, assembly shape and its expected service life are factors to be considered. Decisions must be made on a rivet metal or alloy. Type and size of rivet, shape of head and shank, depth of tubular section must be all determined. Are indexing fixtures and multiple setters indicated? Can a standard rather than a special rivet be used? These are the type of questions Chicago Rivet Engineers are daily answering for industry. Their recommendations are available to you without cost. We suggest you send a blueprint or sample assembly with your inquiry.

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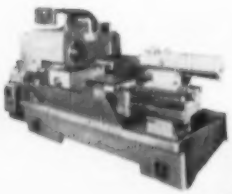

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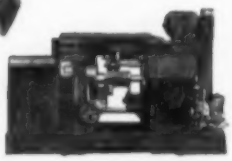

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Surface Speed Dictates Choice of Cutting Tool Material

When multiple operations are performed on a single machine, surface speeds of the various operations may vary appreciably. Thus, to secure the optimum of production, tool life and finish, cutting tools of different materials may be required. V-R Tantung Cast Alloy is the answer on operations involving surface speeds too low for efficient use of carbides.

Tantung bridges the gap between the maximum speeds possible with HSS and the minimum speeds practical with cemented carbides. On 1020 steel, for example, the general Tantung cutting range is between 80 and 200 SFPM, whereas carbide is generally used at speeds in excess of 200 SFPM.

Vascoloy-Ramet offers a complete range of Tantung and carbide tools to meet multiple operation requirements. Your local V-R field service engineer offers valuable assistance in the correct selection of cutting tool materials for maximum machining efficiency. For complete information, call him . . write today.

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TOOLS *of today*

Radial Drill

Precision 3-ft radial drill has an unusually large transmission case which encloses feed gears in an oil bath for constant lubrication. Drive gears are wide and 16 spindle speeds are provided in uniform steps. A drill ejector in the spindle facilitates tool changes, while the arm is raised and lowered by push buttons. Working height is 26 inches.

A floor level base model has 52 in. capacity under the spindle, while a

double-end base model which, by swinging the arm 180 deg., provides 62 in. capacity under the spindle.

To reduce downtime all models are designed to permit quick removal of head, transmission, drive unit, or elevation gear box.

Veet Industries, 25753 Groesbeck Hwy., East Detroit, Mich. **T-12-1**

Deburring Machine

The Speed-D-Burrmatic is capable of finishing parts up to 10½ ft in length in groups of four or six pieces, depending upon configuration. Parts are held firmly by a holding fixture and lowered by hydraulic power into a pre-selected abrasive media where a sliding motion through the media deburrs or surface finishes to the precise degree required. When the short time cycle is completed, the holding fixture automatically lifts up from the media to a position for easy removal. As little as thirty minutes are required for the operation.

Engineered for building-block setups, two or more units may be placed in tandem to permit finishing of extremely long parts: Two units together can process lengths to 21 ft; three units, lengths to 30 ft, etc. Units may be assembled in tandem, disassembled, reassembled to any desired length at any time. In tandem use synchronization, timing and operation of all units is possible using the master control panel and master actuating switches.

The machine also is adaptable to finishing smaller parts normally run in a fixture-type barrel.

Speed-D-Burr Corp., 3613 San Fernando, Rd., Glendale 4, Calif. **T-12-2**

Boring Machine

The LeBlond-Carlstedt Rapid Borer, which will solid bore, trepan or counterbore long holes at high speeds, has capacity for holes from 5/16 to 4¼" diameter in a broad range of work sizes. It is suited to work that is, or can be made, symmetrical for balance in rotation. The machine also successfully handles identical parts which can be bored as one piece, then cut apart.

The Rapid Borer was developed to accommodate new tooling which cuts at very high speed with excellent accuracy and finish. Cutting oil, forced between the boring bar and hole wall to form a continuous bearing, flushes back through a hole in the boring head and bar and carries away the chips. Chip

form is controlled both by tool angles and proper feed and speed combination; thus tool faces are kept clean and chip passage clear. Cutter design produces balanced cutting pressures thereby controlling concentricity.

It incorporatees high spindle horsepower; ample rigidity throughout; absence of vibration at all speeds; infinitely adjustable feeds, independent of speeds, while running under load; final drive to spindle through belts; large volume of cutting oil. The machine is available in 3 sizes, No. 15, No. 30 and No. 60.

The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. **T-12-3**

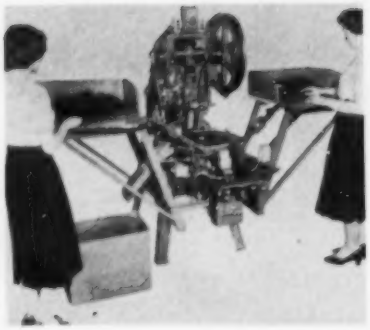
Hot Stamping Press

A multicolor hot stamping press has been developed through addition of a special front extension, incorporating dial, automatic feed and electronic controls, to the standard 2AH press. An arrangement also added to the head of

the press allows two or three colors to be hot stamped at one time.

Design features include: an adjustable dwell period to suit the work; an adjustable pressure provision to meet specific requirements of material that is being hot stamped; and an automatic control that provides preheat contact followed by the proper amount of pressure.

Automatic temperature control, independent automation roll leaf advance for each color are are also provided. In event of jam or lack of parts in the



duo-feeding, a photo-electric interlock stops either or both feeds, automatically. Operating speed is 130 two-color pieces per minute at 100 percent loading. After turning the switch, one lever controls complete operation. Each operator has a separate control to the main unit control which are used only for positioning. With an optional automatic positioning unit, the entire production of these parts may be made automatic.

Designated as Acromark Model 2AH multicolor hot stamping press with dial feeds and electronic control, this equipment is readily adaptable for use in an automated line.

Overall size of the press is approximately 10 x 3 x 6 ft. The Motor is ½ hp ac 220/440 v, 3 phase, 50-60 cycle with overload and low voltage protection. The air feeder operates at approximately 80 psi with all controls provided with lubricating unit muffler, etc. Solenoid operation 115-volt controls, low-voltage photocell interlocks.

The Acromark Co., 607 Morrell St., Elizabeth 4, N. J. **T-12-4**

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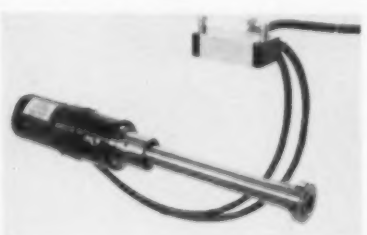
USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Collet Control

Designed for machines using draw-in collets or fixtures, this air actuated collet control is pushbutton-operated. It is constructed without lever, diaphragm or cylinder, and operates at



continuous cycle in excess of 4500 rpm.

Thrust and radial loads on the 3½ x 10 in. tool are absorbed by bearings, providing vibrationless performance.

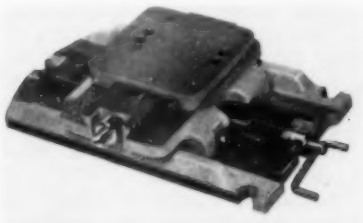
Adams Equipment, Reseda, Calif. **T-12-5**

Feed Table

Feeds and slides for multiple combinations of metalworking are provided by this feed table, designed to give more versatility to the Versa-Mil. It also provides additional adjustments on standard machines and precision feeds and slides for jig or fixture setups.

Four feed table sizes are available

with longitudinal feeds varying from 8½ in. on the smallest to 42½ in. on the largest. Cross feed on all is 3⅜ in. Lead screw is calibrated to 0.001 in. Ways are 6 in. wide, and tapered gibs are standard. A connecting hand lever provides manual feed. Hydraulic, pneumatic cylinder or electrically powered unit is readily added to provide auto-



matic feed. It is possible to machine close to the surface on which the feed table is supported, by removing the lower carriage to reduce height from 3 5/16 to 1 11/16 in. thus providing one direction of travel only.

The Dumore Co., 1300 Seventeenth St., Racine, Wis. **T-12-6**

Dual Speed Hydraulic Cylinder

Designed to provide alternating speed and power cycles in the same basic unit, the Thrust-O-Matic cylinder can often be substituted directly for single-cycle cylinders with a minimum of modification and minimum over-all cycle time. The unit employs a single pump and motor.

Completely self-contained, this cylinder is equipped with automatic valving—shift from low-power, high-speed to high-power, slow-speed stroke is effected by means of spring loaded valves in the head, responding to increases and decreases in system pressure.

Crown Engineering Corp., 4700 Washington Ave., Houston 8, Texas. **T-12-7**

Corner Notching Unit

The NA 90 deg corner notching unit has ¾ in. dimension from cutting edge to outside face of unit which permits close positioning to other units in a setup. Punch and die blades are each in two segments which can be interchanged, reversed, turned end for end and top to bottom to present eight cutting edges before regrinding is necessary. Fully guided self-stripping punch is permanently aligned with the die.

Units are made in 3 x 3 and 5 x 5 in. sizes, right or left hand, with or without adjustable side gage plates or built-in graduated gage table. Capacities are to ⅛ in. mild steel. Mounting can be done

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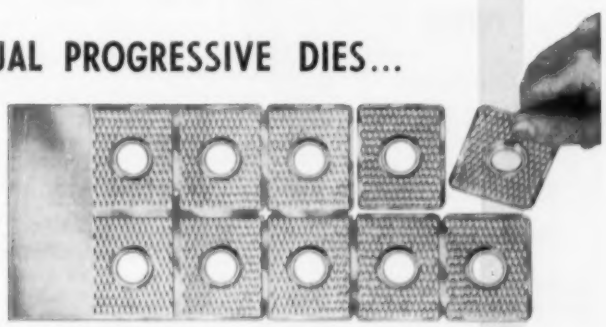
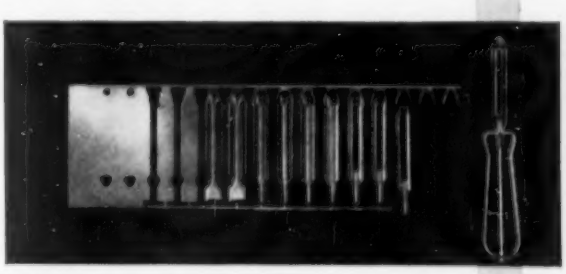


Heat transfer fin-die ribbon. 5 station B. Jahn progressive die. .012" Aluminum — 2 pieces per press stroke — 200 pieces per minute — 96,000 pieces per 8 hour day!

POTATO PEELER



8 station B. Jahn progressive die. .035" cold rolled steel — 60 pieces per minute — 28,800 pieces per 8 hour day!

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1/32" Oversize

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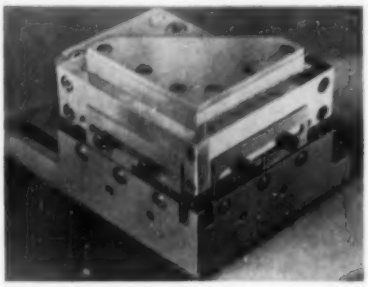
outside the press on mounting templates, T-slotted mounting plates or rails. Nothing is fastened to the ram, which simply contacts a top punch plate to depress the punch to the uniform 5½ in. shut height. Four Strippit springs provide uniform stripping and lifting pressure. Each punch and die



blade is in two parts to facilitate removal. The notching units may be used in the same setup with other self-contained Strippit hole punching and notching units.

Wales-Strippit Co., unit of Houdaille Industries, Inc., Akron, N.Y. **T-12-8**

Moisture Detector

Designed for use with pneumatic-operated control instrumentation the Dew-Point Monitor System accurately detects moisture build-up when it approaches the danger limit in air lines and then actuates an alarm.

The system is comprised of two devices: The Aminco Humistat, a precise humidity controller containing a sensitive electronic switch that actuates an alarm when a preset dew-point temperature is exceeded; and a small plug-in type electric Hygrometer sensing element which instantly senses moisture content changes, and relays these changes to the Humistat.

The sensing element is directly installed within the pressure system by means of a threaded mounting; there is no need for sampling in order to monitor dew-point temperatures.

The Humistat may be set to actuate an alarm for dew-point temperatures as low as -45 F at 50 psi and -60 F at 150 psi. This equipment may be safely used in systems up to 1000 psi.

American Instrument Co., 8030 Georgia Ave., Silver Spring, Md. **T-12-9**

Heating Machine

Constructed on the "building block" principle to provide flexibility for a wide variety of flame heating applications, this Flamatic selective flame heating machine is designed primarily for heat processing applications requiring high or low heating capacity, selective application of heat, precise temperature control and automatic operation.

Basic element of the machine is a flat bed base unit which acts as supporting member for a variety of work-holding and handling fixtures and flame heads. The base houses a large volume quench tank with high-capacity heat exchanger, automatic quench agitation system and a large work-removal conveyor which can be timed to work continuously or intermittently with each heating cycle, permitting delivery to be integrated with plant conveyor systems.

Rear portion of the base houses a mechanical controls compartment for work-handling fixtures. Upper portion of the base is provided with mounting surfaces for work-holding fixtures and flame heads. Push button controls for all machine functions are located on a control panel. Control unit, housed in a separate cabinet, provides accurate control of gas, oxygen, air and water.

A separate rotating spindle work unit is available to simplify processing of parts that are best handled by rotating during the heating cycle. Spindle speeds are infinitely adjustable from 15 to 375 rpm. Automatic spindle retrac-

tion of 10 in. maximum at end of heating cycle immediately drops the workpiece into the quench tank below.

Accurate electronic temperature control automatically terminates the heating cycle and causes the workpiece to be dropped into the quench tank when its surface temperature reaches the preset value.

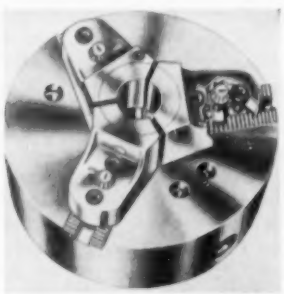
"Building block" principle enables the standard machine base and control cabinet to be used with other work-handling units and flame heads to provide efficient heat treating of a variety of nonrelated types of work. A single power control cabinet can be used to serve several work processing units.

Process Machinery Div., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio **T-12-10**

Chuck Jaws

Designed to avoid soft-jaw boring these chuck jaws are designed to permit rapid job setups and tooling economy.

Individual jaws are eccentric, and, with an individual adjusting device, are easily positioned for truing of the pads. Jaws are adaptable to any univer-



sal air or hand chuck up to 16 in. in diameter. They will accept standard hardened collet pads ordinarily used in turret lathe master collets.

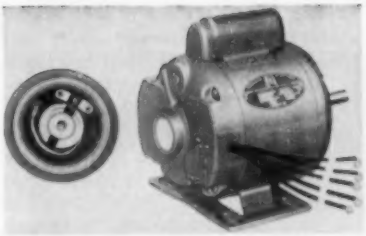
Both soft and hard collet pads are available with chuck jaws.

Bedford Gear and Machine Products, Inc., 550 Krick Road, Bedford, Ohio. **T-12-11**

Reversing Motors

An instant-reversing mechanism for electric motors named Inst-O-Verse, is available with single-phase, 1725 rpm, 115 or 230 v, sleeve or ball bearing motors from ⅙ through 1 hp ratings.

Low-friction nylon shoes are fitted to a machined surface on the shaft and maintain silver contacts in automatically preset position ready for reversing operation. Reversing power is applied by manual or automatic transducer, instantly utilizing full torque



capacity of the motor. The mechanism is installed in the end-bell of a motor and is protected against dirt.

Franklin Electric Co., Inc., Bluffton, Ind. **T-12-12**

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Index Table

This Jacy precision digital index table can be controlled by pushbutton or punched tape and is accurate to seconds of arc. Digital electronic control of a mechanical index mechanism permits infinite resolution from 1 to 21,600 divisions of a circle. Repetitive indices are accurate to within 1 sec of arc.

The table, available in 18, 24, 36 and 45 in. diameters, has a solid mechanical lock with zero backlash which is automatically engaged in all index positions. Compensation for size change of the workpiece due to fabrication or thermal conditions during manufacture, is easily made by the block indexing control feature or through the positioning system.

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electric drives, the tables will operate accurately and efficiently under substantial work loads for most operations.

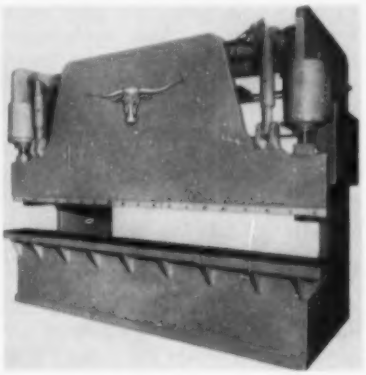
The mobile, electronic console contains both manual and automatic push button controls and punch keys for immediate programming of any indice. The Jacy table can be adjusted to an infinitely adjustable high speed for minimum index time and to an infinitely adjustable creep or jog speed which is provided for setup operations and shockless lockup.

Modern Engineering Service Co., Berkley, Mich. **T-12-13**

Hydraulic Press Brakes

Line of all steel hydraulic press brakes tradenamed Longhorn, are made in from 160 to 1500 ton capacities. Special presses, designed to customer specifications and capacities, also are available.

They are designed to handle all metal forming operations, and for trimming



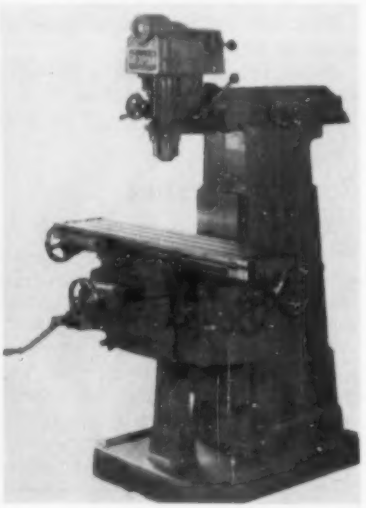
and punching vacuum formed plastics and other materials. All units are equipped with NEMA 12 or JIC standard electrical circuits.

The Perry Co., P. O. Box 2057, Waco, Texas. **T-12-14**

Vertical Mill

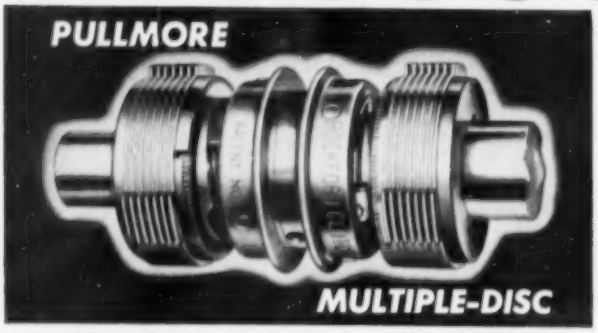
This vertical mill, which offers infinitely-adjustable spindle speed drive, has a rigidly-held rotating head, a vibration-free quill, and positive automatic depth control.

The stepless adjustable-speed drive makes it possible to set the spindle speed precisely in accordance with specifications for the job. Any speed is obtainable from 85 to 560 rpm in low range and 600 to 3,720 rpm in high-



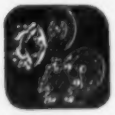
ROCKFORD

PULLMORE

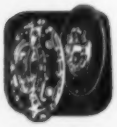


MULTIPLE-DISC

Single or Double CLUTCHES Provide COMPACT Design

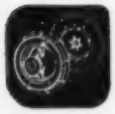


Small Spring Loaded



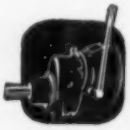
Heavy Duty Spring Loaded

Oil or Dry Multiple Disc



Heavy Duty Over Center

Power Take-Offs



Speed Reducers

These compact, powerful multiple-disc clutches are helping product engineers reduce size and weight between the driving and driven units of machine tools, lift trucks, overhead cranes and a wide variety of other products. Readily fit into product designs, accommodating large torque capacity within small size. Precision grinding insures perfect fit on the shaft, instant, positive clutching and declutching—without drag, heat or abrasion.

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Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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CLUTCHES

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speed range. No changing of belts or gears is required in making a spindle speed adjustment. Only a fraction of a minute is required for adjustment.

Although the head of the Rockford mill is rigidly mounted to the ram, the operator can easily swivel the head to any desired angle through 360 deg.

The motor is mounted in the base of the mill to avoid possible transfer of motor shock or vibration to the spindle.

A positive quill control lever provides a stepless quill feed range from 0 (neutral) to 0.008 ipr. Spindle feed can be stopped instantly.

Quill travel is stopped automatically by a built-in override clutch when the depth gage contacts a micrometer stop, preventing tool or work damage. An overload friction clutch is also provided which prevents the quill from dropping down under the weight of extra-heavy tooling.

Fenlind Engineering Co., 5602 Pike Rd., Rockford, Ill. **T-12-15**

Foundry Cut-off Wheel

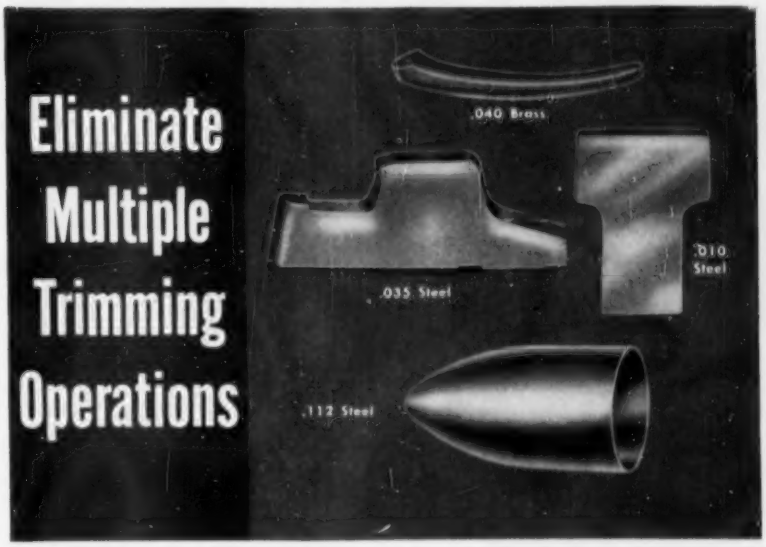
The BZ2AA reinforced cutoff wheel for offhand floor stand and swing-frame applications has an improved resin bond, which provides wearing qualities closely matched to the wearing and fracturing behavior of abrasive grain. It also possesses chemical and heat-resistant properties.

Durable character of the bond makes it suitable for cast iron, steel and ferrous and nonferrous alloys. Diameters are available from 12 to 20 in. with hole sizes to fit all standard floor stand and swing frame machines. Thicknesses range, according to diameter, from $\frac{1}{8}$ to $\frac{1}{4}$ in.

Bay State Abrasive Products Co., Westboro, Mass. **T-12-16**

Automatic Micrometer

A digital read-out automatic electronic micrometer, Model JDR, measures fragile or compressible nonconducting materials and parts to within twenty millionths of an inch. Pressure



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Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness — clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials** — gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber, plastics, **Quantities vary** — Stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1350 per hour. **Shapes** — fountain-pen ferrules, artillery cases, watch cases, burial valuts, automotive, kitchen, radio and television accessories and parts. Almost anything you need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations, are eliminated.

Send part prints for quotation on Brehm "Shimmy" and related dies, such as blank, form, pierce.

THE SHIMMY DIE

Brehm® trimming dies

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VULCAN tools

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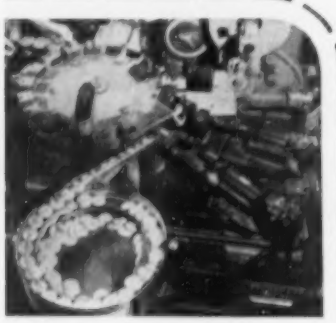
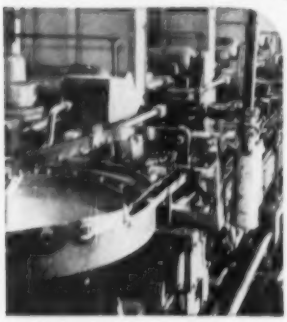
Convert a monotonous manual task into an automatic operation - - with

SYNTRON

PARTS FEEDERS





If you want automatic, oriented position and single line feeding of small parts — SYNTRON PARTS FEEDERS will do that and, at the same time increase production and eliminate the time and costs involved in manual feeding.

Rate of parts flow can be controlled by merely turning a dial to increase or decrease the rate of flow of parts discharge.

They emphatically increase the speed and accuracy of any production operation. Almost every kind of material may be handled—metal, wood, plastic, rubber, ceramic, glass, etc.

Use SYNTRON PARTS FEEDERS if you want MORE production at LOWER cost.

Available in Electromagnetic, Pneumatic or Hydraulic powered units.

Builders of Quality Equipment for more than a Quarter-Century.

Other SYNTRON Equipment of proven Dependable Quality

BATTERY CHARGERS

SHAFT SEALS

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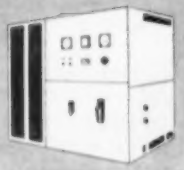

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SYNTRON COMPANY

340 Lexington Ave. Homer City, Pa.

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on the work can be set for a negligible amount if the work is extremely fragile or compressible.

The motor driven instrument requires no operator discrimination other than reading the counter when contact with the work is automatically signalled.

The micrometer is a true direct reading instrument.

It has a measuring range of ½ in. and a throat depth of 2 in. Upper head is adjustable in height to accommodate work up to 1½ in. thick. Standard anvil

is readily removed for use of special fixtures. Repeatability is 0.00002 in.

Electronic unit and motor control are self contained with the base; line switch fuse and sockets for grounded attachment cord and optional foot switch are on rear of base. Motor drive for micrometer spindle is housed within the column. Operating knob at top of instrument permits rapid shifting of zero to any position within the ½ in. range in setting up the instrument.

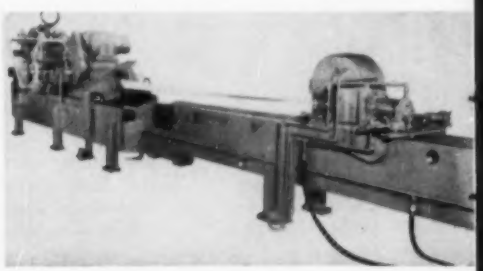
Instrument is 14 in. high, 9 in. deep, 5½ in. wide. Power required is 18 watts at 115 volts a-c.

J. W. Dice Co., Englewood, N. J.

T-12-17

Extrusion Stretchers

Hydraulic stretching and detwisting machines for straightening both ferrous and nonferrous metal sections are available in sizes up to 200 tons. Individual lengths from 4 to 100 ft or more can be stretcher-levelled on these machines at high production rates. The stretchers



handle extruded or rolled bars, tubes, structural shapes or sheet and strip.

The stretchers are available with an optional special open tailstock designed to allow the stock to protrude past the gripping jaws. When using this special head, extrusions of varying lengths may be gripped and stretched without moving the tailstock every time or trimming the extrusions to uniform length. This arrangement also facilitates detwisting of shapes over only part of their total length.

Machines are self-contained and have their oil-hydraulic power units mounted above the stretching cylinder. To facilitate rapid setup for varying lengths, the tailstock has power travel, and its anchoring pins are engaged or withdrawn by an air cylinder. Gripping jaws in both headstock and tailstock are moved by air cylinders and controlled by foot operated valves.

Loma Machine Mfg. Co., 114 E. 32nd St., New York 16, N. Y. **T-12-18**

USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Universal Work Holder

This low cost unit, consisting of a combination light duty vise, and a PowRarm universal work positioner, can be used on benches, pallets, or conveyors, and other light assembly jobs. Moveable jaw travels on gibs that are machined to close tolerances, providing a tight, smooth action. The positioner has a work weight capacity of up to 15

lb. Maximum jaw opening of the vise is 2¼ in., jaw depth is 1⅛ in., and jaw width is 2¼ in. Jaw faces are removable and replaceable. The screw is ⅞ in. in diameter, Acme threaded.

This work positioner, called the Veep PowRarm, can be adjusted to any position in all three planes, and locked in place instantly.

Ruggedly built, the Veep will support a work load of 15 lb at 6 in. Dimensions are 4 x 2¾ x 3¾ in. high.

Wilton Tool Mfg. Co., Inc., Schiller Park, Ill. **T-12-19**

Transfer Unit

Standard lift-and-carry type combination transfer, feeding and unloading unit handles stampings in pressrooms. This portable, plug-in automation package unit can be adapted to handle a wide variety and sizes of stampings. The unit can be used at one press or it can be placed in a line of presses with a continuous transfer bar to provide an automatic transfer line.

Feeder and unloader unit lift mechanism operates in a vertical direction and provides accurate location. Both lift and transfer motions have adjustable strokes.

Air-operated, electrically-controlled air cylinders control the motions of the transfer bar in the feeder and unloader.

The device is comprised of a preload station, transfer bar, intermediate station and lift-and-carry mechanism. Number of intermediate stations,

LONG SHOULDER TYPE—Small toe clamps. Use to keep guide pin in bushing during stroke. Long wearing bronze plated on hardened steel. ¼" to 2" pin dia.

HEAVY DUTY—Large toe clamp, for large and heavy die sets requiring extra body and shoulder. Thin sleeves. Bronze plated 2" to 3" pin diameter.

INSET TYPE—For wide range of requirements. Available in ½ sizes, 1" to 2" pin diameter, long-wearing bronze plated on hardened steel.

GUIDE PINS and GUIDE PIN BUSHINGS

Because high production, quality control and longer die life have become all-important, most stamping plants have now standardized on Lamina guide pins and Lamina bronze-plated bushings.

All Lamina wring-fit bushings are pre-finished on the I.D. Seated on a ground shoulder square with the surface of the die shoe and secured by special retainers, they assure distortion-free, full bearing surface that results in better die alignment, less maintenance and longer die life.

Lamina guide pins are special tool steel, heat treated, spray quenched, ground and burnished. The uniform, hard surface resists wear and the tough core prevents bending during installation or use. The pins are dimensionally accurate, do not "mushroom" or get out of round, and require no "running in".

There is a type and size Lamina Guide Pin and Bushing for every need. Our new catalog gives illustrations, applications, dimensions and prices of more than 800 items. Write for free copy.

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

LONG SHOULDER TYPE—Large clamp. Long bearing surface contains pin during entire stroke. 1" to 3" pin diameter. Bronze on steel.

SHORT SHOULDER TYPE—For die space, more bearing area within die area. Bronze on steel or solid Ampco Bronze. 7 lengths, pin sizes ½" to 2".

RING CLASP TYPE—For heavy duty and housed die sets. Bronze-plated steel or Ampco Bronze. 4 lengths, pin diameter 2½" to 4½".

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-159

(which receive the parts) in the feeder unit depends on press spacing.

When the press has completed its cycle, unloading fingers on the transfer bar pick up the finished stamping and advance it to the next operation while another part is loaded into the die.

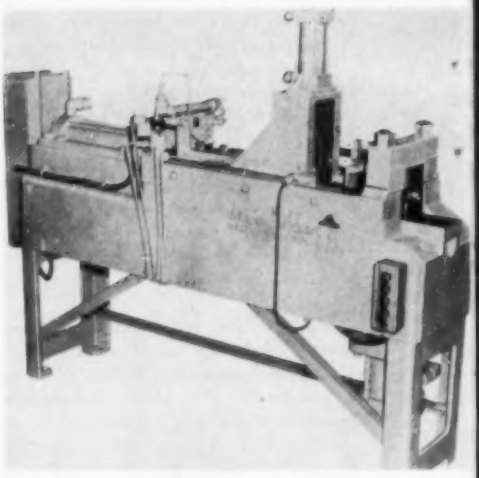
This standard PAS lift-and-carry combination feeder and unloader unit occupies approximately 3 by 8-ft floor space and is about 42 in. high.

Press Automation Systems, Inc., 25418 Ryan Rd., Centerline, Mich. **T-12-20**

Tube End Forming Machinery

The No. 7S double stroke tube end forming machine is hydraulically operated to provide smooth, quiet motion for reducing or pointing the ends of tubing. The tube is clamped in a pair of split blocks and a tapered ring is pushed over the end of the tube.

Two reducing rings were made for reducing a 2⅛-in. O.D. x 0.049-in. wall welded-steel steering column to an inside diameter of 1⅞-in. for a length of



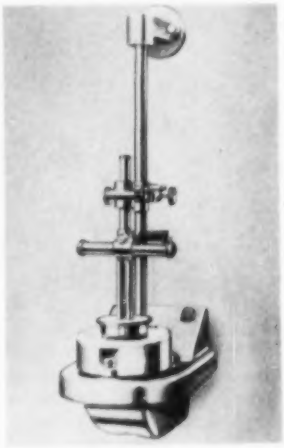
approximately 7 in. Inside sizing mandrel, used in conjunction with the second-operation reducing ring, enables a close tolerance to be held on the inside diameter of the reduced section.

The machine also can be tooled up for expanding, flanging, flaring, double flaring and beading the ends of tubing. Combinations of these shapes may be obtained through the use of the double stroking feature.

Vaill Engineering Co., 137 E. Main St., Waterbury 20, Conn. **T-12-21**

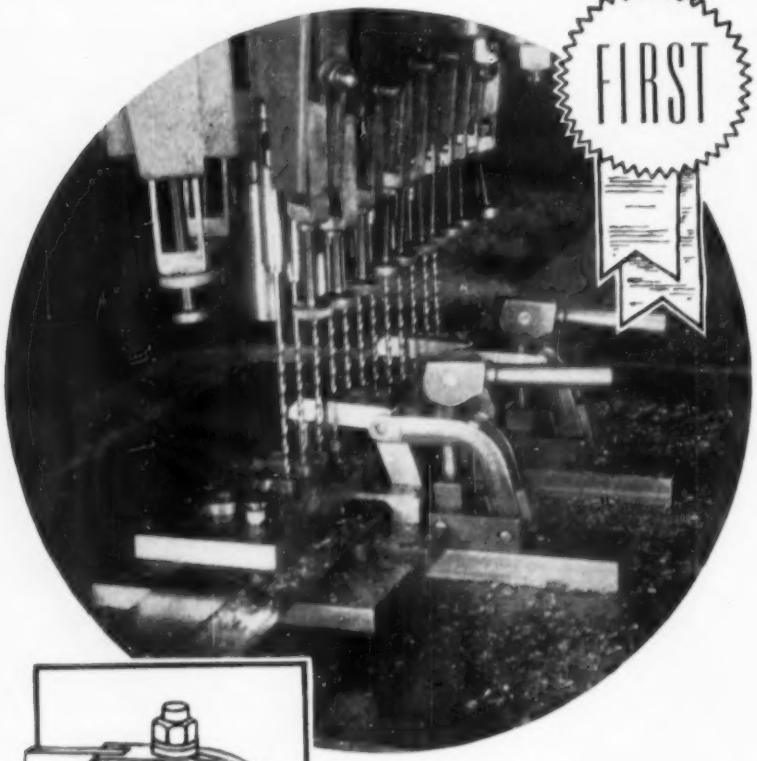
Self-Checking Comparator

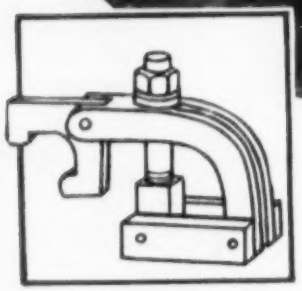
Readings may be made to 0.000001 in. on this self-checking comparator manufactured by Coventry Gage and Tool Co. Ltd., England, for exact measurement of gage blocks and length bars. The wall-mounting type will check a gage up to 40 in. length; the bench type checks to 14 in. in length. As end bars are positioned vertically for checking, sagging does not have to be considered.



The device consists of a sensitive

ANOTHER LODDING FIRST





Lodding Double-Acting Retracting Clamp — clamps in two directions simultaneously. Comes in 4 sizes each of 3 types — hand knob, nut and hand cam.

Now ready for you at your nearest Lodding distributor

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"New York Twist Drill supplies Aircraft Standards (NAS) A, B & C types

AT NO EXTRA COST!

Meeting the strict specifications of National Aircraft Standards, NEW YORK's Type A, B and C twist drills are specially designed for heavy duty drilling. Their sturdy construction and precision points last longer and give greater production . . . Best of all, you pay no premium for these special types.

Another heavy duty drill is NEW YORK's own Type 75 for deep drilling in 75ST aluminum. This high tempered, extremely abrasive metal can be a real headache — but not with NEW YORK drills. They bite in clean and easily, giving more holes, all perfectly round and on size.

Remember, NEW YORK *saves you 20% on your twist drill bill* and you get top quality work every time!

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30-A North Clinton Street, Chicago 6, Ill.

INDICATE A-12-161

level, mounted on an aluminum cradle which moves up or down a pillar. The upper side of the base has 5⅛ in. diameter platen, ground and lapped to a few millionths of an inch. To this platen, the gages are wrung into such a position as to be under the balls of the level, and can be quickly gaged.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill. **T-12-22**

Vertical Miller

Longitudinal travel of the table of this vertical milling machine is air-actuated. The unit illustrated has a 12-in. double action Hydro Check, with

a 15-in. air motor cylinder. Air motors and Hydro Check units can be supplied for 1½ to 18 in. of travel, depending upon the operation to be performed.

Duff Machine Co., 31 Wingate St., Haverhill, Mass. **T-12-23**

Vise For Saw Filing

Circular saw blades 4 to 18 in. diam may be sharpened quickly and accurately with the Model 346 filing vise. Blades with arbor holes of ½ to 1¾ in. slip over a threaded stud assembly and are held firmly in place by a cone. The cone is then turned for desired amount of tension, allowing blade to be rotated by file pressure to bring each tooth into position.

This slip type saw cone remains together at all times, so there is only one piece to release for reversal or removal of saw blades. The rigid back vise supports the blade at filing point to prevent chatter. When filing large saws, a spring tension lever swings down over the

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PHILADELPHIA MAY 1-8

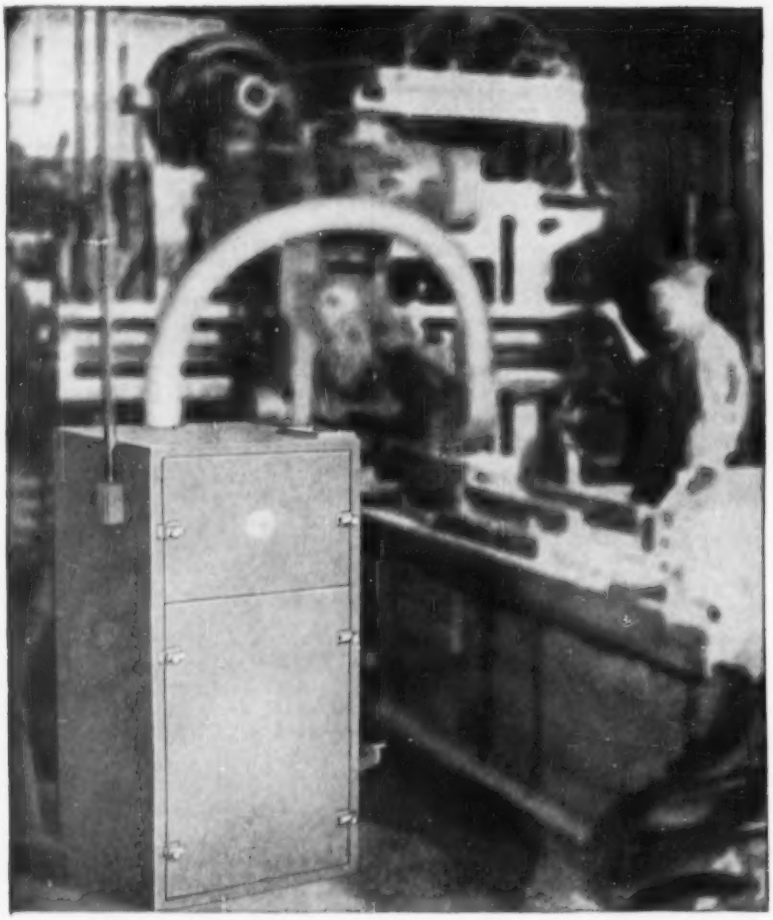
SEE all the very latest advances and improvements in more than thirty major categories of industrial products.

ATTEND top-level conferences, conducted by recognized authorities on the newest production techniques and developments.

MEET and exchange ideas with management, engineering, production, sales people from the nation's leading industrial concerns.

INSPECT the modern equipment and up-to-the minute manufacturing methods being utilized in booming Delaware Valley plants.

AMERICAN SOCIETY
TOOL SHOW CONFERENCE '58 MAY 1 TO 8
OF TOOL ENGINEERS



How *unitized* Torit Dust Collectors cut your costs . . . protect machines and worker morale

Here's the most flexible and economical method of trapping dust that damages your equipment and creates employee health and morale problems. Torit units trap dust at its source. They're completely self-contained and portable. This means you can install Torit Collectors yourself, shift them as requirements change, operate them only as needed. They can be suspended or installed next to the machines they service. You can wire them directly through equipment switches to conserve power and let them return filtered air to the room to save heat. There's a complete range of types and sizes to choose from, fully described in the free booklet offered below.

6 machines serviced by Torit for $666.15 complete. This Torit Model 219FM was installed at the Mohr Lino Saw Co., Skokie, Ill. to collect dust from 3 belt sanders and 3 different types of grinders (2 grinders hidden from view). The Collector *plus* all accessories were supplied by Torit at a total cost of $666.15—another example of the economy and efficiency Torit offers you.

New Free Handbook on dust control. 28 pages, full details on Torit units. Write:

TORIT MANUFACTURING COMPANY
311 Walnut Street, St. Paul 2, Minn., Dept. 1309
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-162

blade for increased tension and to prevent vibration.

Adjustment is fast and positive. Saws may be filed either vertically or locked at any tilt angle to 45 deg. Slotted angle adjustment bar indicates 15, 30, and 45 deg for accurate positioning.

Industrial Dept., Foley Mfg. Co., 3600 N.E. Fifth St., Minneapolis 18, Minn.

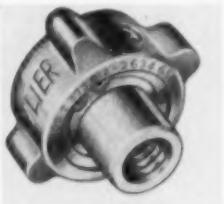
T-12-24

USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Adjustable Torque Handle

Clamping pressure on jigs and fixtures, assemblies, machinery, etc., can be controlled by this adjustable torque handle for application in place of torque thumbscrews.

End pressure is adjustable from 15 to 200 lb. The tapped hole is available



in three sizes: 5/16-18; 3/8-16; and 1/2-13. The aluminum handle is die-cast with a cast-in hardened steel insert.

Vlier Engineering, Inc., 8900 Santa Monica Blvd., Los Angeles 46, Calif.

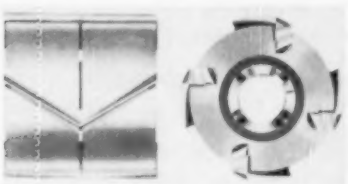
T-12-25

Milling Cutters

Inserted-blade plain milling cutters for machining aluminum incorporates a blade design that provides twice the normal grinding life. Cutters using the Double Life Blades come in 4-in. wide right and left hand sections. Suitable for use in gangs made up of equal numbers of right and left hand sections, as shown in the illustration, this arrangement neutralizes end thrust during machining and permits maximum blade utilization.

When grinding life has been used up on the first side of the blades, they are reversed and interchanged between left and right hand cutter sections. Every blade will fit either a left hand or right hand cutter section interchangeably.

Cutters are available in diameters ranging from 8 to 11 in. All standard cutter sections are four bladed. Blades



are flat-backed with the tooth face milled on a 30 deg spiral, resulting in a constant hook. Mating serrations in blade and body and a dovetailed wedge hold blades securely, yet permit easy replacement.

Goddard & Goddard Co., 12280 Burt Rd., Detroit 23, Mich. **T-12-26**

USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Portable Nibbler

Titanium, stainless and nonferrous metals can be cut without distortion on either side of the cut by the Model HN portable nibbler which leaves the edge ready for fabricating.

The portable tool cuts up to 55 ipm, with minimum radius of 6 in. For a

shorter 3 in. radius, a special die holder is available for use on 12 ga stainless and lighter metal.

Weighing only 13 lb, and measuring only 13 in. in length, the HN nibbler operates on ac or dc, 115 volts, 60 cycles, with 220 volt optional.

Fenway Machine Co., Willow Grove, Pa. **T-12-27**

Gear Checker

The Micrac (TM) provides an accurate, automatic method for checking fine pitch gears on a production basis and delivers a permanent, visual record of gear quality on straight line graph

paper. Both spur and helical gears can be inspected.

The Micrac principle introduces a master worm of extreme accuracy that rotates in intimate contact with the work gear. The single thread worm makes one complete convolution for each tooth in the production gear. The recording mechanism consists of a sensitive electronic pickup and amplifier. Simple dial control provides a broad range of magnification. It is possible to obtain a short chart to check over-all gear quality or an elongated chart for analytical checks.

Capacities of the checker are ⅜ to 3 in. center distance; 0 to 9 in. distance between head and tailstock centers; 200:1 to 800:1 amplification range; master worms to 180 D. P.

Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. **T-12-28**

Roll Forming Machine

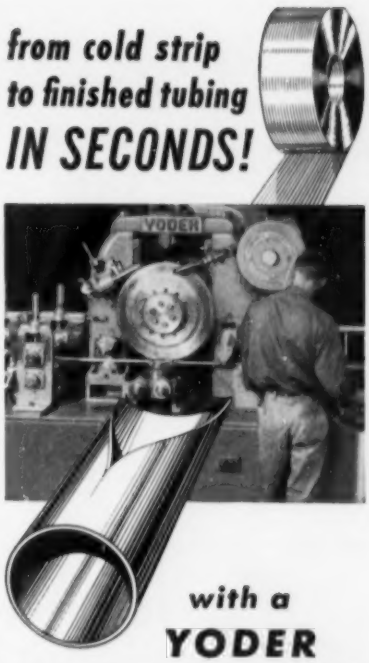
Galvanized steel, aluminized steel, plain and embossed aluminum can be corrugated with this roll forming machine which provides facility for handling of 20 through 28 gage metal. Other gage ranges are available to meet requirements.

Design features include all-welded construction; roll shafts mounted on antifriction bearings; only vertical adjustment required for gage range. Operating speed is 150 fpm.

Roller die tooling is available for ½ or ⅞-in. depth, with precise control of coverage and depth.

This setup is available as an individual unit for feeding sheets, as illustrated, with a decoiling and shear-

from cold strip to finished tubing IN SECONDS!



with a **YODER ELECTRIC-WELD TUBE MILL**

One of the fastest . . . and one of the least expensive . . . methods of making steel tubing is with a Yoder Electric-Weld Tube Mill. The Yoder method eliminates the need for time-consuming heat treatments and costly conditioning furnaces for most tube needs. Scrap losses, too, are far lower than any other method . . . usually less than 2%.

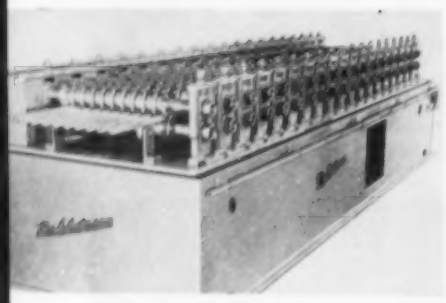
The Yoder Type-M Mill shown above is operated by one man and a helper. Coiled strip on this mill is continuously cold-roll formed, welded and cut to required lengths in a matter of seconds . . . at speeds up to 340 f.p.m. The quality of the resulting tube is *constantly* better than the requirements of commercial standards. This is one of many reasons why manufacturers and users of tubing the world over are using more Yoder mills than all other makes combined.

If your business requires pipe and tubing, ferrous or non-ferrous, in sizes from ¼-inch up to 26-inch diameter, Yoder can supply the engineering service and machines to produce it faster and better for less! For complete details, write for the Yoder Tube Mill Manual. It's yours for the asking.

THE YODER COMPANY
5525 Walworth Ave. • Cleveland 2, Ohio

YODER ENGINEERING MANUFACTURING **PIPE AND TUBE MILLS** (ferrous or non-ferrous)

INDICATE A-12-163



ing line conveying cut lengths into forming machine; or as a complete roll-forming line utilizing coil stock and cutting to length.

Dahlstrom Machine Works, Inc., 4227 W. Belmont Ave., Chicago 41, Ill.

T-12-29

Remote Controlled Testing Machine

Split cabinet Electomatic testing machines, suitable for remote control testing, are constructed so the loading and indicating units are completely separate, and are connected only by electrical wiring. As a result, the two units can be positioned at any angle or located at any distance in separate rooms or buildings.

All controls for the loading and indicating systems are centrally located on the face of the indicating unit. Test speeds, which are eelctronically controlled, are positive under load or no load and the machine has an unlimited test stroke.

Loads are indicated on a 28-in. illuminated dial, which provides four separate ranges with a ratio of up to 100: 1. All ranges have the same zero, enabling the operator to change ranges quickly during test by a flip of a switch.

Tinius Olsen Testing Machine Co., 7221 Easton Rd., Willow Grove, Pa.

T-12-30

Surface Grinder

This 10 x 16 in. capacity surface grinder incorporates a direct motor driven spindle mounted on precision preloaded, sealed and lubricated ball bearings. One horsepower, 1,750 rpm motor is included with push button starter. Motor and spindle are precision balanced. Grinding wheel is 12 in. diameter.

Back edge of table and T-slots are ground square to spindle and may be used for aligning work. Longitudinal travel is operated by hand feed rack and pinion gear with large handwheel. With one revolution of handwheel, table is traversed a full six in. The

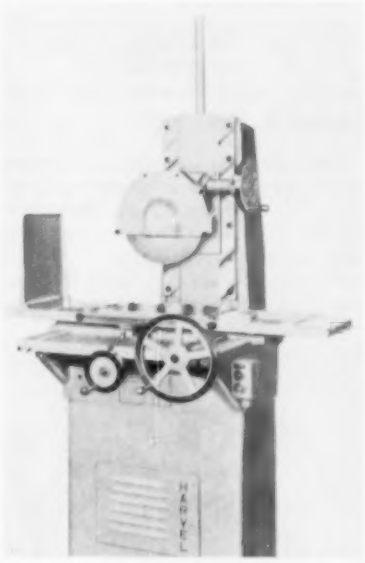


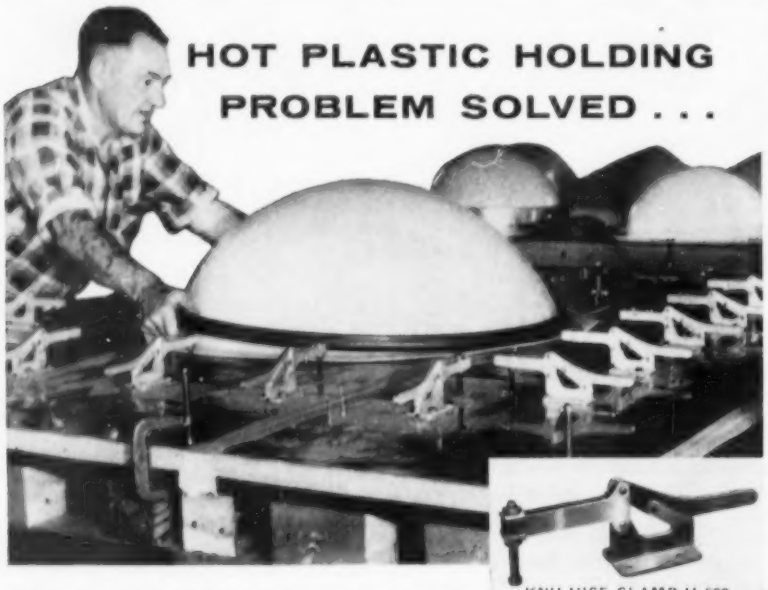
table rides on one Vee and one flat way. All feeds are by hand.

Construction features include telescoping dust guards, hard chrome vertical front ways and adjustable table stops. Crossfeed handwheel is graduated in thousandths of an inch.

Harvel Co., 5135 Coffman-Pico Rd., Pico, Calif. **T-12-31**

Drill Press Vise

Rapid action is combined with unlimited takeup in this drill press vise. It incorporates the Rapid Titan nut which engages and disengages the



WITH KNU-VISE CLAMPS

It's a plastic dome skylight . . . produced by "blowing" heat softened plastic sheets under 30 lbs. of air pressure. To hold the hot plastic during the "blowing" process clamping had to be safe, positive, dependable. To handle the various sizes and shapes of skylights produced clamping had to be versatile. And to speed production, clamping had to be fast to grip, quick to release. Knu-Vise clamps provided the answer to all these requirements . . . can answer your holding problems, too. For complete information or engineering assistance write Lapeer today.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

3053 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: ART LEWIS PRODUCTION EQUIP. CO.
419 Magnolia Street, Glendale, California

CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-164

screw automatically. There are no buttons, springs, or triggers. Threads are brought into contact with the screw by rotating the vise handle in the tightening direction. The screw is released for free sliding action by turning the handle counter-clockwise. The nut is in a fully enclosed housing, and cannot be damaged. There are no moving parts or sharp edges. The drill press vise is 4½ in. wide, has a solid base, and can be turned on edge for accurate 90 deg drilling. Ends of the base are cut back, and sides of the vise are machined to form a right angle with drill press tables. The vise is only 2¾ in. high, but has a full 1¾ in. jaw depth.

Wilton Tool Mfg. Co., Inc., Schiller Park, Ill. **T-12-32**

Measuring Microscope

A Leitz microscope for the electronic and instrument field uses a 200x magnification with an optical micrometer reading in 0.00005 in., in which 0.00001 in. can be safely and easily estimated. A 400x magnification is optionally available with direct reading in 0.000025 in. Measurements may be taken in *x* or *y* axis, by rotating ocular 90 deg against a stop.

Built-in vertical illumination is standard equipment, but understage illumination through a stage glass in the measuring stage can be provided.

Opto-Metric Tools, Inc., 137 Varick St., New York 13, N. Y. **T-12-33**

Die Handling Table

Loads up to 2,500 lb can be easily lifted, moved and transfered to another surface by this Big Beulah die handling table. The reinforced top plate has an area 22 x 34 in. and is

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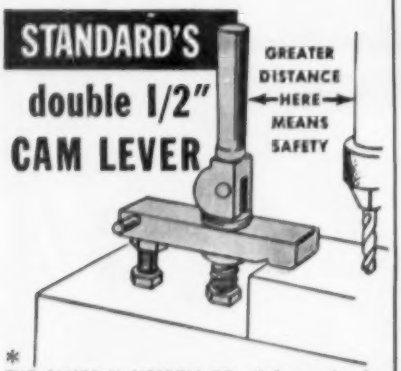
...up to 3,450 lbs. clamping force



*THE JAMES H. HERRON CO., (Laboratories for Testing, Analysis and Inspection) reports as follows: "With reference to the Double Cam Lever (500) and Eye-Bolt (500), we have conducted experiments to determine the amount of clamping force a man can exert with this device, lubricated. "Without the use of any auxiliary equipment, it was found that a man could exert up to 3,450 pounds, by bringing the lever to a position 90° with the Eye-Bolt."

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- Safe Operation—with handle *vertical* before clamping (as illustrated).
- Constant Maximum Clamping Pressure—perpendicular to center line of lever.
- Certified 6-Ton Back-Pressure Resistance—no danger of cam backing up.
- Ready to Use—no altering needed on assembly.
- No Lever Breakage—solid steel handle.
- This Cam can be applied to your Specially Designed Assemblies. Quotations on request.

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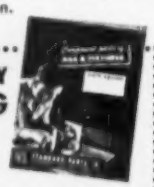

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fitted with eight recessed conveyor rollers to facilitate moving loads.

Loads are pushed from table to press or storage shelf, or are pulled to the table by a ram, impelled by a screw and nut device, which travels the length of the top plate. Vertical movement of the top plate ranges from 35 in. to 60 in. above floor level.

Floor locks and turnbuckle hooks prevent movement of the table during loading and unloading.

The Hamilton Tool Co., 9th St. at Hanover, Hamilton, Ohio. **T-12-34**

Multiple Drilling Heads

Two models of universal ball joint adjustable spindle multiple heads have circle type spindle arrangement: Model 600 has 6 spindles; and Model 800 has 8.

Either model may be attached to any standard drill press through an Ettco-Emrick drilling or tapping face plate; or they will fit any standard Ettco drilling or tapping unit or machine. The heads will run at top speed in any operating position in either direction without vibration, regardless of spindle location.

Spindles can be quickly added to or removed from the gear case, or located anywhere within a 3 in. diameter with a $1\frac{5}{16}$ in. minimum center distance even while the unit is running.

The gear case provides 1:1 drive to driven spindle ratio.

Where advantages of fixed spindle operation are desired, aluminum templates, jig-bored to requirement, can be supplied instead of spindle locating arms.

Ettco Tool & Machine Co., Inc., 594 Johnson Ave., Brooklyn, N. Y. **T-13-35**

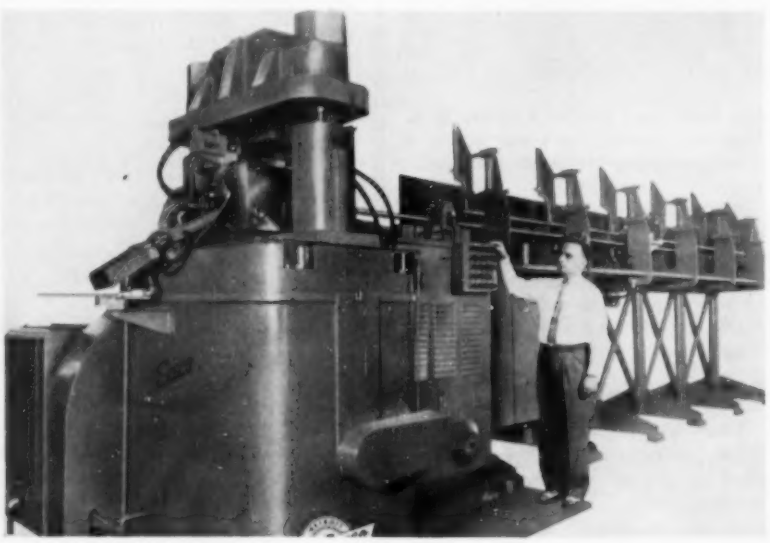
USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Bar Feed and Cutoff

This bar feed and cutoff machine consists of a bar stock storage rack and loader, a hydraulic gripper bar feed, and a short stroke underdrive cutoff unit. Entire assembly is constructed to receive and process bars of random lengths and, with minor changes, will process bars of various diameters. The model shown will process bars from 1 to 2 in. in diameter, and features a 175-ton cutoff that cuts parts within a tolerance of $\frac{1}{10}$ of an ounce, from a machine finished bar.

The crank operated cutoff unit is driven through a conventional bull gear, pinion and flywheel arrangement, and is automatically clutched and braked by air.

Sesco Inc., 8881 Central Ave., Detroit 4, Mich. **T-12-36**



Press

Double geared, straight side Model MS2 press is designed for unusually higher single stroke efficiency, based upon rated continuous press speed, and a wide speed selection.

The air friction clutch and brake unit is located on a slow turning intermediate shaft instead of within the fly-

wheel on the high-speed drive shaft. The user may select either the faster speeds of a conventional single geared machine or the slower speeds of a double geared press.

All air, lubrication and electrical systems are complete, enclosed within the press frame line. MS2 presses are available in capacities ranging from 150 to 500 tons.

Minster Machine Co., Minster, Ohio. **T-12-37**

Storage Feeders

Orienting storage feeders of 5, 10 and 20 cu ft storage capacity elevate, orient and feed parts having overall dimensions of from ⅛ x ⅛ x ¼ in. to parts as large as 3 x 6 x 10 in.

Irregular stamped, machined and cast parts are readily oriented and fed. A single unit may be tooled to feed a family of parts. Production rates range up to 300 pieces per minute.

The storage elevator is constructed of heavy steel plate, and uses a hardened steel plate elevating chain. The drive is located within the hopper base and features adjustable speed drive, foot mounted standard motor, and overload clutch. Parts are propelled by the natural frequency conveying method.

The unit pictured is a 5 cu ft model and is tooled to feed a centerless

grinder. The natural-frequency feeding principle delivers the parts under power to the machine being fed and there is no need for a gravity feed track. It will feed a range of parts from ½ in. diameter x 4¾ in. long to ¾ in. diameter x 6 in. long. Parts being fed have been turned, threaded, drilled, milled and slotted in previous operations. Parts having soft machined surfaces, including threads, are fed without harm.

Campbell Machines Co., 18634 Fitzpatrick, Detroit 28, Mich. **T-12-38**

Cold Cutting Saws

These high-speed steel segmental cutting saws for all cold sawing machines are designed so that the rounded back of tooth augments strength. Large radius of gullet clears cut by curling up chips in manner similar to lathe turnings. Roughing and finishing teeth alternate. Roughing teeth are beveled

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Electrolytic carbide tool grinding is a revolutionary method of fast and precise stock removal. Carbide is removed by electro-chemical action with the diamonds wiping away the products of electro-chemical decomposition. As a result . . .

80% to 90% of the cost of diamond wheels can be saved . . .

Production will increase and operator fatigue will be reduced . . .

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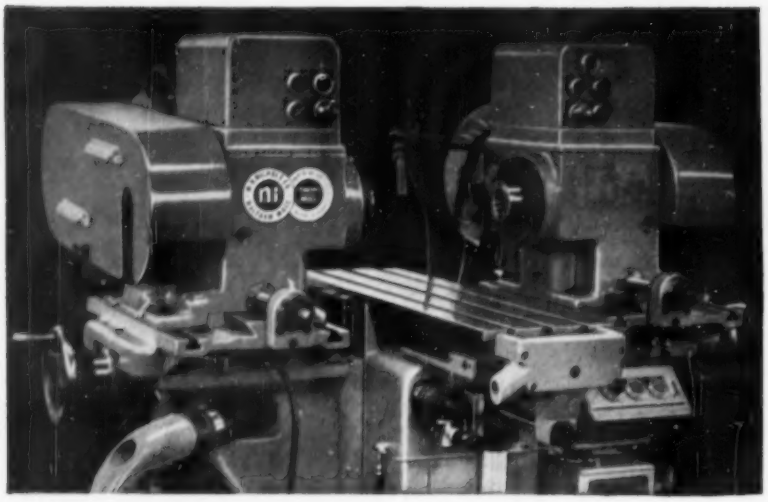

Twin Mill

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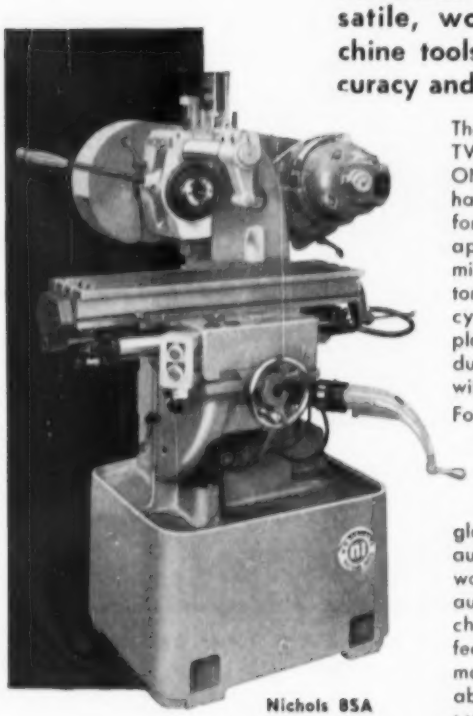
Ideal Basic Machines for Automatic Production

NICHOLS MILLERS are versatile, work-devouring machine tools, unexcelled in accuracy and fine workmanship.



Nichols 8SA Semi-automatic

The TWIN MILL is practically TWO milling machines in ONE. Opposed Milling Heads have SIX-WAY adjustability for quick set-up and flexible approach to complex light milling operations. Push a button, and an automatic table cycle gives you TWO completed milling cuts. This unique duplex Miller is a cost-cutter without equal!

For high production precision milling where the double-barrelled approach of the TWIN MILL is not required, there are single spindle NICHOLS Semi-automatic Millers of varying work ranges. In addition to automatic table cycles, synchronized automatic downfeed of spindle head and automatic cross feeds are available.

NICHOLS MILLERS have a magnetic attraction for the Tool Engineer's ingenuity.

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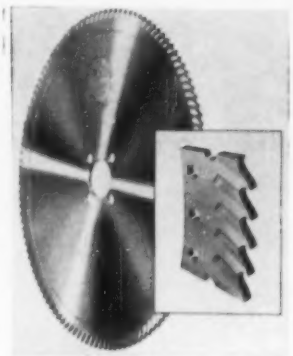
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-168

on either side with each bevel one third of tooth width. Finishing teeth are not beveled and are ground 0.015 in. below roughing teeth.

In operation, roughing teeth of this Insto saw remove center of cut, permitting following finishing tooth to complete cut by removing outer corners. Load is reduced on each tooth, resulting in high speeds, with low driving



power without overstressing the saw. Tooth design minimizes friction and prevents metal adhering to sides of teeth. It also assists in flow of lubricant to cutting edges, assisting in cooling saw and increasing saw life.

Insto saws make a clean, square, precision cut that in many instances requires no secondary finishing operations. A complete range of diameters, numbers of segments, and tooth pitches are available.

Ernest F. Donley's Sons, Inc., 10203 Miles Ave., Cleveland 5, Ohio. **T-12-39**

USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Toggle Clamp

Four De-Sta-Co Tiny Toggles which are only ¾ in. high and 2¾ in. long when closed provide holding pressure up to 42 lb.

This Model 105 series is made up of 105-UB, 105-U, 105-SB and 105-S. The "U" and "UB" models have U-bars for

holding adjustment spindles, which are furnished with all four clamps. The "U" model has a horizontal base, whereas the "UB" has a vertical base. There is the same difference between the 105-S and the 105-SB, only these Tiny Toggles have solid holding bars.

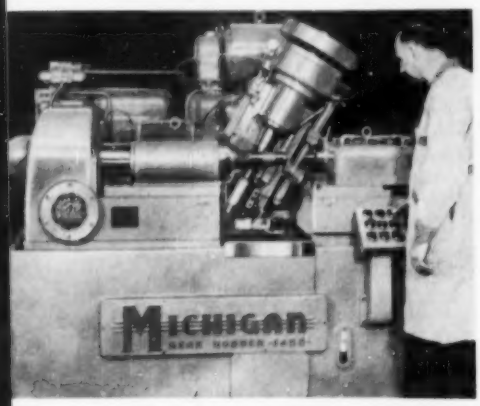
Each of the four clamps also comes with a base-spacer mounting-plate, 3/32 in. thick.

Detroit Stamping Co., 328 Midland Ave., Detroit 3, Mich. **T-12-40**

Gear Hobber

A high-speed horizontal, single spindle gear hobber, Model 1458-B, has an 8-inch center distance between hob arbor and work spindle. The entire hobbing cycle is automatic with the machine returning to the loading position upon completion of the part. Loading and cutting time for most gears is measured in seconds. Either conventional or climb hobbing may be used with single or multiple thread hobs. Gear washers and gear classifiers can be easily integrated with the machine. Automatic size control can also be provided.

An inboard-mounted guide assembly introduces the lead to the work spindle



while work is being traversed across the hob. The guide facilitates straight gear hobbing; for spiral gears it controls the helix angle being cut. All necessary assemblies of the machine are mounted on a common surface of the machine base, minimizing maintenance.

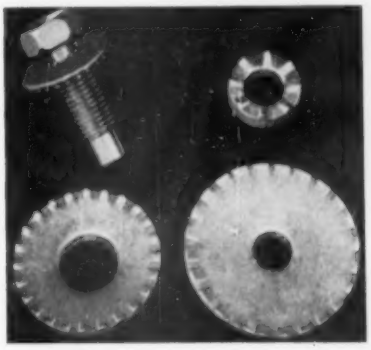
The Model 1458-B hobs up to 4-pitch spur or helical gears. Maximum center distance, hob arbor to work spindle, is 8 in. Maximum crossfeed stroke of hob is 5 in. Either right or left-hand helix angles up to 35 deg can be hobbed.

This hobber includes an automatic expansion arbor for workholding and a size control mechanism which adapts to the Z-bar infeed mechanism.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **T-12-41**

Lock Washer

This 3-way lock washer has barbs on both the inside and the outside diameters to provide secure locking. The barbs



are hardened to enable them to embed themselves satisfactorily into the mated metal, and provide what is essentially an integral assembly. There is virtually no movement.

The washer, called the Hi-Lock serves as both a flat and lock washer. Locking is vertical, horizontal and rotary to withstand excessive vibration.

Hi-Standard Stamping & Mfg. Co., 18228 James Couzens, Detroit 35, Mich. **T-12-42**

Chemical Stripper

Flaky, light organic compound developed for chemical stripping operations is combined with sodium cyanide and dissolved in water. It will strip plated deposits from ferrous base metals without the use of electrical current. It re-

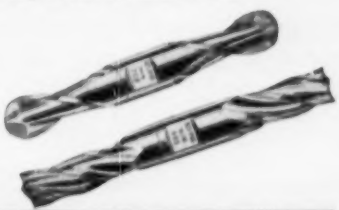
FINE CUTTING TOOLS by Eclipse

Since 1913 Eclipse has been consistently and conscientiously serving many companies in widely diversified fields of production. Each of these companies has found that "Engineered by Eclipse" is assurance of genuine quality in end cutting tools.

- High Speed Steel Cutters
- Carbide Tipped Cutters
- Core Drills
- Inserted Blade Cutters
- Multi-Diameters
- Back Spotfacers

and remember . . .

Eclipse now has a complete line of Precision End Mills. Ground from the solid, Eclipse End Mills insure longer tool life, finer finishes and lower production costs.



- Write for Counterbore Cat. No. 51
- Write for End Mill Cat. No. 56

ECLIPSE COUNTERBORE COMPANY
DETROIT 20, MICHIGAN
END MILL DIVISION—NORTH BRANCH, N. J. ADDRESS (BOX 97, RARITAN N. J.)

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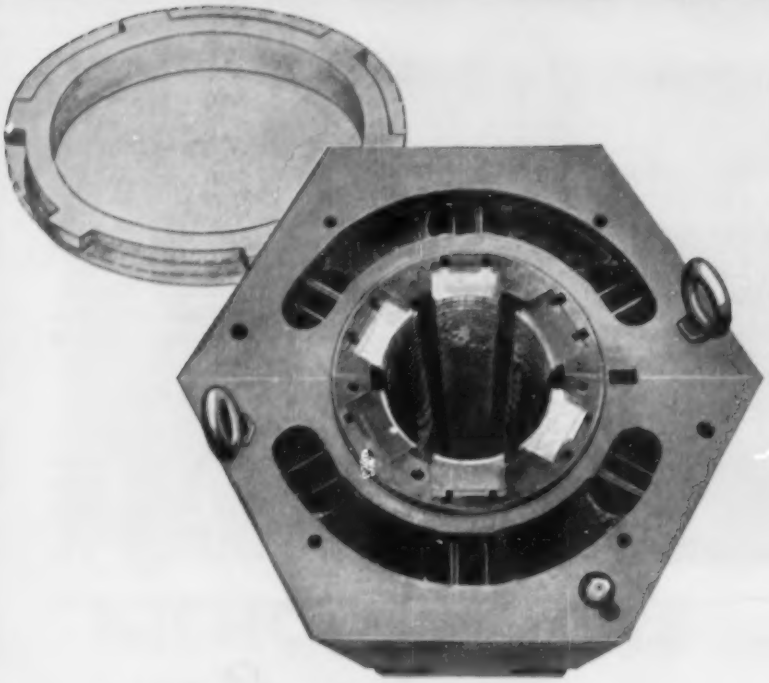

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JUST THIS: Behind it, is a backlog of 56 years of engineering experience devoted exclusively to the art of broaching . . .

• From this experience came the pot-type design which permits the broaching of planet ring gears from the solid, in the most efficient manner possible — one pass, in 20 seconds, removing all the stock between the tangs in the 15-inch periphery . . .

• Broach sections are made of special steel (our own controlled formula), precision-ground to extremely close tolerances, assuring unusually long life between sharpenings.

It's what's behind a broach, that counts! Intelligent engineering, quality materials, skilled grinding hands — they all add up to perfection in the finished product, *good broaches.* We would welcome the opportunity to design and make your next lot of broaches.

LAPOINTE-BROACHES, *Electrolized* increase broach life between grinds from 2 to 10 times.

THE LAPOINTE MACHINE TOOL CO.
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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

LAPOINTE
known to be the best in
BROACHING

moves copper, nickel, cadmium, zinc as well as silver, and size of the part does not affect results.

The compound, marketed under the trade name of Iso-Strip, does not etch the base metal, eliminates racking procedures, requires no supervision, and it can be used in a cold state by simply increasing immersion time. Parts may be stripped in baskets or barrel tumbled.

Equipment required are a plain still tank, draft box, coil and temperature regulator.

Although the Iso-strip solution does not deteriorate while standing, it is consumed during stripping operations. Because sodium cyanide decomposes faster with increases in temperatures the development is not designed for operating temperatures above 150 F.

Wagner Brothers, Inc., 463 Midland. Detroit 3, Mich. **T-12-43**

Tube Cleaning Drill

This carbide-tipped tube cleaning drill has been designed for efficient removal of hard scale as well as soft

coagulated deposits from inside walls of condenser tubes.

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. **T-12-44**

USE READER SERVICE CARD ON PAGE 173 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Boring Bar

Double-end boring bar is encased with tungsten carbide to reduce chatter and provide economical precision boring.

The illustrated tool, which also is made in a range of sizes for machine

shop use, has a 1¾ in. square cross section and is about 14 in. long.

Kendex type clamping mechanisms are recessed in each end of the bar to hold the chipbreaker, insert, and seat. Two different types of Kendex indexable inserts, triangular and square, are used on the ends of the boring bar.

Kennametal Inc., Latrobe, Pa. **T-12-45**

abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

During a recent visit to English, French and West German industrial plants and universities this writer's attention was called to some foreign publications that would be of interest to tool engineers although the originals are not readily available in the United States.

Metallurgical Processes in the Grinding of Steel

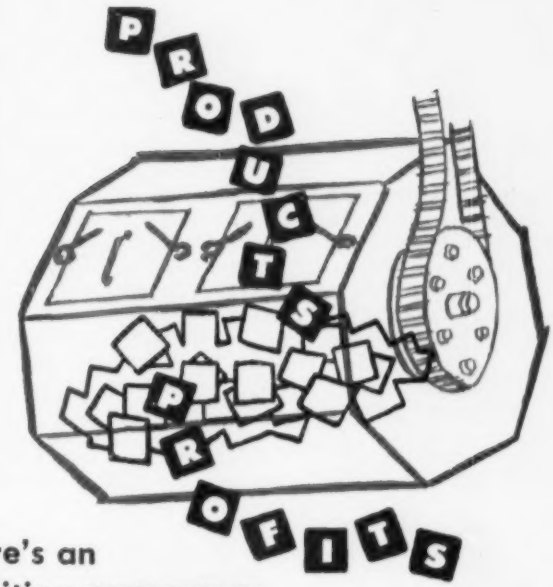
An article titled "Mettallurgische Vorgaenge beim Schleifen von Stahl" by H. Studinger appears in the Swiss periodical *Schweizer Archiv fuer angewandte Wissenschaft und Technik*. The article deals with the structural change in the surface layer of steel during grinding. It is indicated that heat-treated steels with Rockwell hardnesses above 60 are adversely affected by grinding unless stress relieved at 300 to 350 deg F. The author presents theories to account for cracking, burring and structural changes. Ground surfaces of various types of steels, such as carbon steel, tool steel and high-speed steel, are illustrated.

The author has investigated the changes in the hardness caused by grinding and concludes that, to reduce or eliminate grinding troubles, excessive contact pressure must be avoided. The grinding wheel must always be well dressed and properly selected in accordance with the requirements of the job.

Electroabrasive Machining with Graphite Fillings

The Russian literature on machining and metal-cutting science has increased considerably during the past years, particularly with regard to spark erosion or other methods used in the machining of hard metals.

An article by I. K. Trushin in *Vestnik Mash*, May, 1957, Vol. 37 No. 5, deals with progress made in the machining of carbide tools with so-called electroabrasives. The abrasives are suspended in a liquid through which a direct current



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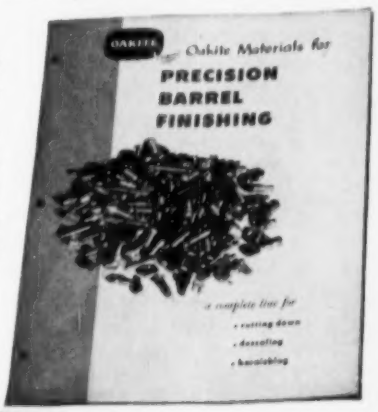
PUT your products in the barrel
TAKE your profits out

One of the greatest money-saving opportunities in metal-working lies in the use of barrels to finish parts by the hundreds in place of conventional methods that finish one part at a time.

Barrel finishing makes easy work of many tough jobs of grinding, deburring and buffing by wheel.

One Oakite customer changed to barrel methods to deburr curved stainless steel strips that are 14 inches long. The cost for deburring 20,000 strips was reduced from $3,000 to $125.00.

FREE For a copy of *"Precision Barrel Finishing"* —containing valuable information on cutting down, deburring, descaling, and burnishing—write to Oakite Products, Inc., 58 Rector Street, New York 6, N. Y.



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is passed. An electrically conductive lapping compound was used for initial trials. Later, conductive grinding wheels were used with graphite fillings. These produced a high surface finish.

This method has much in common with anodo-mechanical machining, since the action is probably due to anodic solution. The abrasive grains remove particles from the working zone and also prevent a short-circuit between the work surface and the electrically conductive bond of the wheel. Oxidation of the surface of the workpiece takes place. This nonactive film facilitates grinding.

The anodic film is removed by the wheel and the wheel rotation supplies the grinding zone with the required liquid. Ordinary grinding machines can be used and the material is removed at a high rate of speed. Finishes are finer than those produced by a diamond wheel. The method is used for gages, plugs and similar parts.

Grinding of Carbide Tools

In an article in the Russian periodical *Stanki i Instrument*, 1957, Vol. 28, No. 6, B. S. Korshunov describes tests on the grinding of carbides with abrasive wheels. He indicates that the grinding operation involves two simultaneous processes: the mechanical separation of particles by tearing and partial shearing of carbide grains; and the oxidation of carbides and bonding material caused by the high temperature at the grinding zone. The carbides tested were mainly cobalt-bonded.

Both internal and external cooling are therefore important. The internal coolant acts as a lubricant. Tests were begun in 1956 on carbide T 15 K6 (Russian standard) where T 15 stands for 15 percent Titanium Carbide and K6 stands for 5 percent Cobalt. The balance is tungsten carbide. The tests were run at a grinding wheel speed of 3200 fpm and a feed of about 0.080 ipm. The abrasive in the wheels was green silicon carbide. Some wheels were bonded with Bakelite, others with ceramic. Spindle oil was used for internal cooling. External cooling was with 3-5 percent aqueous sodium nitrite.

The results indicated that bakelite bonds were inferior to ceramic bonds as far as wear is concerned and that the grinding efficiency with Bakelite bonds, especially with double cooling, is much lower than that obtained with ceramically bonded wheels. Internal cooling without external cooling does not produce a satisfactory surface finish and may result in considerable temperature rise in the wheel and damage to the tool. Best results and best surface finishes were obtained with double cooling.

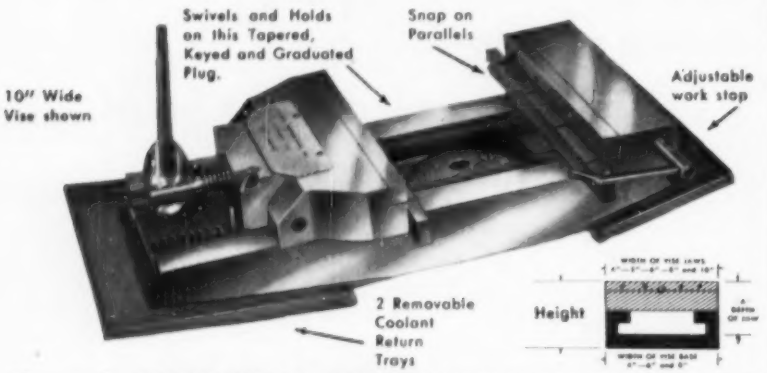
Tool Wear in Machining Operations

After describing the various causes of tool wear, G. Vieregge presents data on the depth of the crater and on the wear land as affected by various feed rates, tool materials, work materials, cutting speeds (up to about 550 fpm) and heat treatment. His article is published in *Stahl und Eisen*, 1957, Vol. 77, No. 18 under the title "Der Werkzeugverschleiss bei der spanabhebenden Bearbeitung im Spiegel der Verschleiss-Schnittgeschwindigweits-Kurven."

Curves representing the relationship between wear and cutting speed reach a maximum at a relatively low cutting speed when machining steel, which can be explained by the increased removal of tool material due to pressure welding between tool and chip. At medium cutting speeds, the wear drops to a minimum, due to softening of the work material at the tool-chip interface. In these cases, the strength of the tool material exceeds that of the work material. A further increase in the cutting speed leads to another increase in wear and finally to the breakdown of the tool. In the case of high-speed steel tools, this breakdown is caused by softening of the cutting edge. In the case of carbides, it is caused by diffusion of chip and tool material.

In machining cast iron with carbide tools, it was found by diffusion testing that carbon has the tendency to travel into the carbide, particularly when the cobalt content is high. Such diffusion weakens the bond in the tool. Consequently, the wear resistance of the cutting edge is reduced.

When machining steel the trend is reversed. Here the work material has a


Swivels and Holds on this Tapered, Keyed and Graduated Plug.
Snap on Parallels
10" Wide Vise shown
Adjustable work stop
2 Removable Coolant Return Trays
Height

The only HARDENED & GROUND SWIVEL MILLING MACHINE VISE

No Pedestal

WIDTH	OPENING	DEPTH OF JAW	HEIGHT	WEIGHT
4"	6"	2⅝"	3½"	23 lbs.
5"	8"	2⅝"	3½"	27 lbs.
6"	9"	2⅝"	4"	55 lbs.
8"	12"	3½"	4½"	100 lbs.
10"	12"	3½"	4½"	115 lbs.

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-12-67	American Broach & Machine Div. Sundstrand Machine Tool Co.	Broaches—Practical broaching methods by American described in Bulletin A721. (Pages 66-67)
A-12-11	The American Tool Works Co.	Lathes—American 32-in. hydraulic tracing lathe described in Bulletin No. 135. (Page 11)
A-12-22	Automation Devices, Inc., Perry Equipment & Engineering Co. Div.	Feeders—Peeco vibratory parts feeders described in Bulletin 563. (Page 22)
A-12-54	Bakelite Company Div. Union Carbide Corp.	Resins—For information on tooling with Bakelite brand of epoxy resins, write Dept. AM-181. (Page 54)
A-12-220	The Bellows Co.	Air Motors—TE-1257 describes "The Place of the Bellows Air Motor in Original Equipment Design." (Page 220)
A-12-58	The Blanchard Machine Co.	Grinding Machines—The 18-C automatic cycle surface grinder described in Folder 18-C. (Page 58)
A-12-149	Chicago Rivet & Machine Co.	Rivets—Catalog contains engineering data and rivet specifications. (Page 149)
A-12-51	The Cincinnati Milling Machine Co.	Machine Attachments—Cincinnati 10, 12 and 14-in. dividing heads described in Publication No. M-1924. (Page 51)
A-12-55	Colonial Broach & Machine Co.	Broaching Machines—Automated horizontals for faster surface broaching described in Bulletin HM-56. (Pages 55-56)
A-12-232-1	Covel Precision Grinders	Grinders—Covel No. 10 surface grinder described in Bulletin TE-127-10. Covel No. 14 optical comparator described in Bulletin TE-127-14. (Page 232)
A-12-194	Arthur A. Crafts Co., Inc.	Carbide Tools—Catalog describes "Complete Carbide Tooling for Automation." (Page 194)
A-12-256-4	J. Arthur Deakin & Son	Special Machines—Catalog D describes Alexander deep throat engraver and other special British machines. (Page 256)
A-12-29	DeVlieg Microbore System, Div. DeVlieg Machine Co.	Special Tooling—Catalog 58 describes Microbore tooling and methods. (Page 29)
A-12-207	Eastman Kodak Co.	Projectors—"Projection Gaging with Kodak Contour Projectors" describes Kodak simplification of measurement problems. (Page 207)
A-12-169-51	Eclipse Counterbore Co.	Counterbores—Engineering data contained in Catalog No. 51. (Page 169)
A-12-169-56	Eclipse Counterbore Co.	End Mills—Catalog No. 56 contains engineering specifications. (Page 169)
A-12-205	Ex-Cell-O Corp.	Tool Grinder—Dual purpose reciprocating tool grinder described in Bulletin 461872. (Page 205)
A-12-190	The Gaertner Scientific Corp.	Microscopes—Bulletin 147-56 describes models and gives specifications for toolmakers' use. (Page 190)
A-12-31	Gisholt Machine Co.	Balancers—Gisholt's general balancing machines described in Form 1109BD. (pages 30-31)
A-12-5	Hardinge Bros., Inc.	Collets—Bulletin 56 lists collet ordering information for all lathes and millers. (Page 5)
A-12-217	Haynes Stellite Co., Div. Union Carbide Corp.	Cutting Tools—Characteristics of Haynes Stellite metal cutting tools described in bulletin. (Page 217)
A-12-33	Heller Tool Co.	Band Saws—Heller Nucut bandsaws described in catalog. (Pages 32-33)
A-12-153	The B. Jahn Mfg. Co.	Dies—Catalog contains case histories and engineering specifications of progressive B. Jahn dies. (Page 153)
A-12-191	Jarvis Corp.	Cutting Tools—Solid carbide tools described in catalog. (Page 191)

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A-12-178	Lepel High Frequency Laboratories, Inc.	**Induction Heating**—Catalog contains data on Lepel induction applications. (Page 178)
A-12-234	The Lodge & Shipley Co.	**Shears**—Twenty-four-inch speed shear described in Bulletin No. PS-12. (Page 234)
A-12-222-2	W. F. Meyers Co., Inc.	**Bushings**—Bushing catalog No. 42 gives details on Meyco carbide inserted bushings. (Page 222)
A-12-186	Micrometrical Mfg. Co.	**Measurement**—Profilometer Group 2 described in Bulletin LT17. (Page 186)
A-12-171	Oakite Products, Inc.	**Special Machine**—Catalog describes Oakite materials for precision barrel finishing. (Page 171)
A-12-70	The Ohio Crankshaft Co.	**Induction Brazing**—Catalog shows "Typical Results of Tocco Induction Brazing and Soldering." (Page 70)
A-12-219	Onsrud Machine Works, Inc.	**Special Machine**—Catalog 1162 describes Onsrud Mach-Mil for non-ferrous production in milling. (Page 219)
A-12-26	The Osborn Mfg. Co.	**Brushes**—Production brushing described in Catalog 210-C and 20-page Brushamatic booklet. (Page 26)
A-12-270-1	Parkwood Laminates, Inc.	**Tooling Material**—Technical bulletin describes Hi-Den, a laminate of wood veneers impregnated with phenolic resin. (Page 270)
A-12-238	The Producto Machine Company	**Die Sets**—Producto die sets and accessories described in Catalog No. 11. (Page 238)
A-12-156	Rockford Clutch Div. Borg-Warner	**Clutches**—Bulletin shows typical installation of Rockford clutches and power takeoffs. (Page 156)
A-12-166	Standard Parts Co.	**Fixture Components**—Catalog describes Standard's jig and fixture components. (Page 166)
A-12-10	Standard Pressed Steel Co. Unbrako Socket Screw Div.	**Capscrews**—Form 2239 "Class 3A Threads: what they are; how to gage them" available. (Page 10)
A-12-197	Stupakoff, Div. of The Carborundum Co.	**Cutting Tools**—Stupalox oxide cutting tools described in Catalog 257. (Page 197)
A-12-198	The Tomkins-Johnson Co.	**Cylinders**—Catalog SM56 gives engineering details on spacemaker line. (Space 198)
A-12-162	Torit Mfg. Co.	**Dust Collectors**—Catalog gives full details on Torit units for dust control. (Page 162)
A-12-256-2	Unitron Instrument Div. of United Scientific Co.	**Microscopes**—Bulletin TM describes Unitron's combination toolmakers' and metallurgical microscopes. (Page 256)
A-12-228	United States Drill Head Co.	**Drill Heads**—Catalog AD-57 describes universal adjustable U. S. drill heads. (Page 228)
A-12-59	Waldes Kohinoor, Inc.	**Grooving Tools**—Waldes Truarc grooving tool described in technical manual. (Page 59)
A-12-256-3	West Point Mfg. Co.	**Work Holding**—Catalog gives details for jig and fixture components. (Page 256)
A-12-252-1	S. B. Whistler & Sons, Inc.	**Dies**—Catalog describes Whistler adjustable perforating dies. (Page 252)
A-12-163	The Yoder Co.	**Special Machine**—Manual describes Yoder electric weld Tube Mill. (Page 163)

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tendency to "pull" carbon out of the carbide tool, forming mixed molecules of $(WFe)_3C$ when the temperature at the cutting edge reaches or exceeds 1470 F. Titanium, tantalum-carbides and titanium-tantalum-tungsten carbides resist this dissolution process better than pure tungsten carbides and hence are better for the machining of steel than tungsten-carbide-cobalt tools.

Milling cutters often wear faster than turning tools when the actual cutting times are equal. This may be explained by the fact that the lower cutting temperature at the instant of engagement of milling cutter and work favors the formation of the aforementioned welding regions. The location of the engaging point of the tool tip in milling cutters is often unfavorable, causing high cutting forces which are also responsible for the greater wear of milling cutters.

Curves prepared for the relationship between wear and cutting speed based on tests of only two minutes' duration already give a good indication of the performance to be expected. Effect of heat treatment can likewise be judged from such curves. In the author's opinion, short cut tests to establish the relationship between wear and cutting speed may be used for determination of the best cutting conditions.

Rotary Drilling in Mining

The application of carbide tools to the mining of potash has led to great improvements in output as indicated by K. Jaeger in *Bergbautechnik*, 1957, Vol. 7, No. 4, pages 202-207. He describes various drilling machines, drill rods and tool bits. Further improvements will be possible when a carbide that has high impact and wear resistance is developed. These characteristics are necessary to operate satisfactorily in different layers of varying hardness. The title of the article is "Das drehende Bohren im Kalibergbau."

Another article dealing with the application of carbide tools in mining operations appeared in *Schlagel und Eisen*, 1957, pages 439-444, authored by O. Mueller. He discusses the use of hollow crowns of carbide layers with embedded diamonds. These tools are used for core drilling under particularly difficult conditions. The title is: "Der gegenwaertige Stand der Anwendung von Hartmetall im Bergbau."

Deutsch Edelstahlwerke, West Germany's major stainless steel and high alloy grade fabricator, has been integrated into the Thyssen-Huette group. Also announced by August Thyssen-Huette, was purchase of 35 percent ownership in Huettenwerke Siegerland, Europe's largest sheet steel producer.

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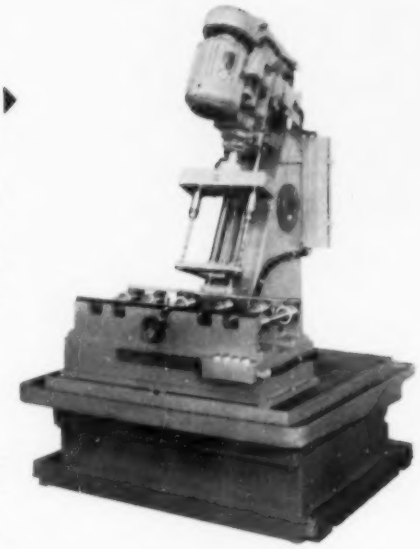
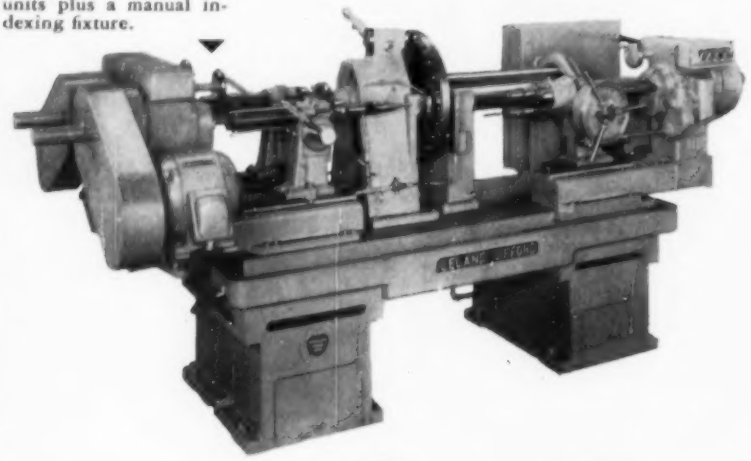


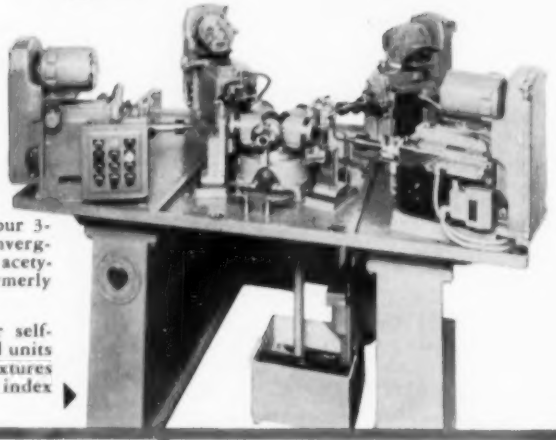
THE JOB — Drill two .630 x 3¾" x 25° holes in 4-cylinder and 6-cylinder crankcases.

THE SETUP — A No. 3 self-contained step feed unit with 2-spindle head, special base cabinet with roller-type fixture, plus angular top column. Ties into conveyor line to eliminate lifting.

THE JOB — Drill and ream 48 holes (tap and countersink 24) in an aircraft turbine shaft.

THE SETUP — Two single (left) and one 2-spindle (right) horizontal V-belt units plus a manual indexing fixture.





THE JOB — Drill four 3-diameter deep converging holes in copper acetylene torch tips. Formerly a hand operation.

THE SETUP — Four self-contained step feed units plus five holding fixtures and a hydraulic index table.

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FIELD notes

Hobart Trade School, an educational institute sponsored by Hobart Brothers Co., is building a new technical school to help meet the need for technicians who know both how to weld and how to readily apply welding solutions to engineering problems. The new Hobart Technical Institute is an outgrowth of the Trade School. Need for a new technical center indicated a demand that it be operated on a higher level, with the ultimate goal of a full two year curriculum leading to a certificate of Welding Associate. The 80,000-sq ft building will house adequate classrooms, laboratories, an auditorium, research department, library and complete administrative facilities.

v v v

The DoAll Co.'s traveling exhibit "The Story of Measurement" has started its second season on the road, and arrangements are being scheduled for engineering and technical societies. This exhibit presents, through three-dimensional display panels, the development of measuring standards, techniques and instruments used to control quality of work done by material shaping tools. Primarily it serves to portray the improvement of man's material welfare through the use of tools. Information regarding bookings may be obtained from the company's Gage Div., 254 Laurel Ave., Des Plaines, Ill.

expansions

A $350,000 plant for the Split Ballbearing Div. of Miniature Precision Bearings, Inc. is under construction in Lebanon, N.H. The new facilities will more than triple present floor space for the division, and is expected to permit doubling the workforce of 75 employees.

v v v

An openhouse celebration marked completion of the new plant for Dake Corp. at 724 Robbins Rd., Grand Haven Township, Mich. The new structure, built at a cost of about $500,000, provides three manufacturing bays. The central bay is 42 ft high and the other two are 22 ft high, giving ample clearance for moving materials with cranes.

An 18,000-sq ft plant in Garden City, Mich. is being completed for Ellstrom Inc., an affiliate of Dearborn Gage Co. The structure will house offices, engineering and manufacturing facilities.

v v v

Present plant and equipment of Chicago Powdered Metal Products Co. are being expanded to provide for molding presses up to 300 tons. The new facilities will accommodate powder metal parts up to 15 in. in diam. Expansion cost is estimated at $150,000 and is scheduled for completion by January 1.

v v v

Plans for extensive expansion of facilities for its Tonawanda Research Laboratories have been announced by Linde Co. At the present time a high pressure laboratory, metallurgical laboratory, a hydrocarbon storage building and a new services building are to be constructed.

new ventures

Establishment of a Canadian Div. has been announced by Wheelabrator Corp. The new plant is located in Scarborough, near Toronto. Wheelabrator has been active in the Canadian market for the past 12 years, and limited manufacturing of equipment has been done on a subcontracting basis. The Scarborough plant now will permit expansion and improvement of services to industry in that area.

v v v

Parker-Kalon Div. of General American Transportation Corp. is entering the automation equipment field with acquisition of the exclusive American manufacturing and sales rights to patented Pneuma-Serve fastener feeding equipment. The license was granted by Geo. A. Tinnerman Corp.

v v v

Scientific computation and mathematical analysis service are being offered to business and industrial organizations by The Ramo-Wooldridge Corp. The new Computation Consulting and Service Bureau will be operated as a part of the company's Digital Computing Center, headed by Dr. Walter F. Bauer. It will provide assistance in computer applications and digital computing services including numerical analysis, programming and equipment rental.

v v v

Plans for a coast-to-coast network of screw-thread measuring laboratories to help industry with fastener fit and gaging problems have been announced by Standard Pressed Steel Co. The service will be introduced early in 1958 when SPS opens three screw thread metrology laboratories at plants in Jenkintown, Pa., Cleveland and Los Angeles. Basic services of the labs will be analysis of fastener fit problems, checking and setting of screw-thread inspection gages with highly accurate equipment, and the setting up of reliable inspection gaging systems in conformance with recognized thread standards.

new facilities

Colson Corp. has opened a new $3¼-million caster plant in Jonesboro, Ark. The company's complete line of 12,000 industrial casters will be produced in the 89,000-sq ft. Jonesboro plant, which will employ about 220 persons.

v v v

Announcement has been made by Kennecott Copper Corp. that about 200 acres of land in Anne Arundel County near Baltimore have been purchased from the Baltimore & Ohio R.R. The land is to be used as a site for a $20-million electrolytic copper refinery. Plans call for initial monthly capacity of 7,000 tons of electrolytic copper and for operations to begin in 1959.

v v v

A new plant is being built at Glassport, Pa. for the manufacturing and repair division of Westinghouse Electric Corp. Construction is scheduled for completion during the last quarter of 1958. The building, which will house approximately 60,000-sq ft of space and will have a 100-ton crane capacity, will be used to service and repair electrical and mechanical apparatus of industries in the Tri-State area that includes Pittsburgh, Wheeling and Weirton, W. Va., and Steubenville, Ohio.

v v v

First phase of the $¾-million building program for United States Drill Head Co. has been completed with the opening of the Standard Foundry Div. plant at 5928 River Rd., Cincinnati. Two more buildings are to be erected on the 13-acre site. The recently finished 7,000-sq ft structure houses the

The Lepel line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating.

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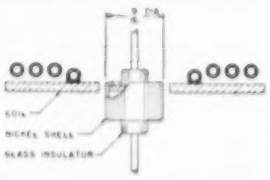

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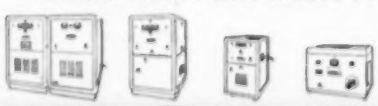

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aluminum, brass and bronze foundry formerly located on Spring Grove Ave. Construction already has begun on the second building in the project. When completed shortly after the first of the year, it will accommodate the Standard Pattern Div. Ground also will be broken shortly for the third unit, which will provide approximately 45,000 sq ft to house the Machine Tool Div.

V V V

Construction is under way on a $2-million instrument precision ball bearing plant for The Barden Corp. in Danbury, Conn. Plans call for erection of a 125,000-sq ft manufacturing plant to be completed next June. In the finished plant, production will flow in a "U" shape around a central service area which will contain the gage room and other departments that service manufacturing activities.

V V V

Ciba Co. Inc. has announced breaking ground for epoxy resin plant and development laboratories located at Toms River, N. J. The facilities are expected to be in operation by mid-1959, and will replace the present capacity of the company's Kimberton plant where the resin and plastics activities are now centered.

V V V

Construction of a manufacturing plant at Danville, Ill., is under way for the Hyster Co. Located on a 53-acre site, the plant will be built in two stages. The first section is scheduled for completion in March, and at that time certain manufacturing facilities of the established plant will be moved to the new site. When the entire plant is finished it will house all of Hyster's Danville operations, including sales and administrative offices, service facilities and manufacturing.

V V V

Controls Co. of America is constructing a 50,000-sq ft light manufacturing plant at North Manchester, Ind. to house operations transferred from its present Spring Valley, Ill. facilities. Occupancy is scheduled for January.

moves

General offices of the Consolidated Chemical Industries Div. of Stauffer Chemical Co. have been moved to larger quarters at Suite 300 South, 6910 Fannin St., Houston, Texas.

V V V

In celebration of the acquisition of larger quarters at 60 Everett St. in Boston, Joseph T. Ryerson & Son, Inc. held openhouse for employees and their families. The new plant, which serves

New England industries with steel and aluminum from stock, covers a quarter-million square feet.

V V V

The A. K. Allen Co., Inc. has moved to new larger accommodations at 255 E. 2nd St., Mineola, N.Y.

sales facilities

Three new branch sales offices have been opened recently by Pratt & Whitney Co. Inc. Locations of the facilities are at 505 Oakwood Ave., West Hartford, Conn.; 9217 W. Center St., Milwaukee, Wis.; and the Linden Industrial Park area of Rochester, N.Y. These, in addition to the earlier office opened at 1220 E. Fourth St., Charlotte, N.C., are first to be put into operation under a major expansion program of branch offices.

V V V

Engineering and sales offices of Production Machinery Corp. has moved its engineering and sales offices to larger facilities at Maple St. and the Nickel Plate R.R., Mentor, Ohio.

V V V

Marking more than 57 years of special steel warehousing service in the Boston area, Crucible Steel Co. of America formally opened its new warehouse in the Waltham Industrial Center on Route 128. A staff of 50 persons, under branch sales manager Burton Reese, serve customers from the new facility.

acquisitions

Wagner Brothers Inc. has purchased outright the Automatic Molding Machine Co. of Los Angeles. Patent rights to the firm's automatic compression and injection molding presses for plastics were part of the transaction.

V V V

Buhr Machine Tool Co. has announced its purchase of The Sidney Machine Tool Co. The acquired firm, which will be operated as a wholly-owned subsidiary will continue to be engaged exclusively in manufacture of Sidney lathes and coil winders, and its present nation wide sales organization will be continued.

V V V

The Indiana Diamond Dust Reclamation Co. has been acquired by the LeVita Metal Alloy Co. and the LeVita Industrial Diamond Co. New location of the acquired firm, formerly located in Orlando, Fla., is at 42 E. Alexandrine, Detroit. At present the company is able to reduce quantities of 10,000 lb of diamond-containing residues per month through its primary operation, while it is able to handle 50,000 carats of reclaimed diamond per month through its finishing laboratory.

V V V

Standard Pressed Steel Co. has acquired the Nutt-Shel Co., a producer of special lightweight locknuts used in missiles, electronic apparatus, aircraft, fuel tanks and related products. The acquired firm also is well known in its field for research and development of new products and new methods of manufacture. No changes are contemplated in the personnel or operations of Nutt-Shel, which now will be operated as a wholly owned subsidiary of SPS.

V V V

Purchase of Hydramotive Inc. has been made public by The American Bosch Arma Corp. The hydraulic starter, known as the Hydrotor, developed by Hydramotive, is considered a natural addition in the product line of the American Bosch Div. which produces diesel fuel injection systems.

V V V

Ogden Corp. has acquired The Eimco Corp. and the American Foundry Machine Co. Operations of both companies will continue to be managed by Eimco president, Joseph Rosenblatt and executive vice-president Morris Rosenblatt.

sales

Robert E. Thomas has been named general sales manager of The Cleveland Cap Screw Co., subsidiary of Standard Pressed Steel Co. At one time assistant general sales manager at Cleveland Cap, he now rejoins the company after two and one half years as sales manager of Triplex Screw Co.

V V V

Wendell F. Carney was named general sales manager of The Taft-Peirce Mfg. Co. to succeed Walter E. Rogers who requested inactive status. Mr. Carney, who joined Taft Peirce in 1941 as a member of the design engineering staff, has been New York sales manager.

V V V

D. F. Adams was named general sales manager by Colson Corp. He formerly held the title of sales manager.

V V V

Change in the organization of Norton Co.'s Electro-Chemical and Refractories Divs. has resulted in several appointments. Harlan T. Pierpont, formerly sales manager of the Refractories Div. is now manager of Sales for the Electro-Chemical Div. and also becomes a member of the operaing board for the divi-

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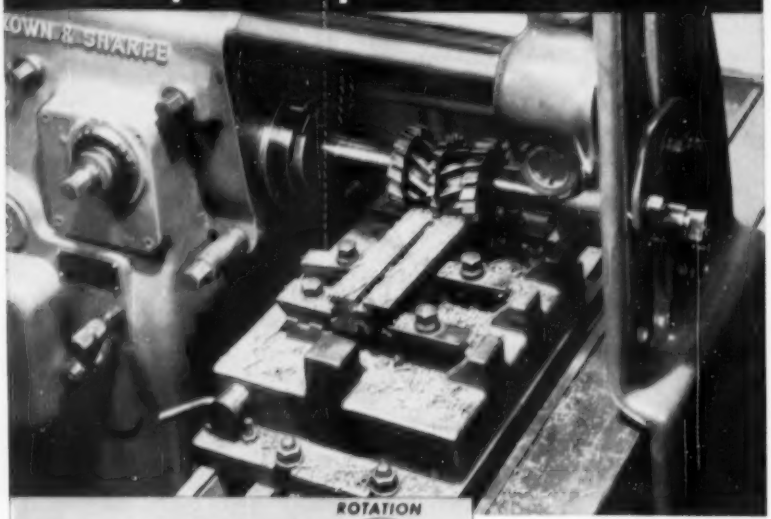
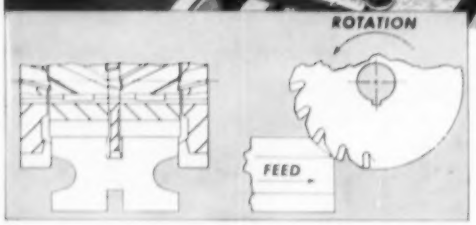
INDICATE A-12-179

Brown & Sharpe CHIPS **Stock removal costs money!...Chips tell *how much***





In climb (down) milling, work is fed in direction of cutter rotation. Chip is thickest at initial engagement of tooth, reaches minimum thickness at point where tooth ends downward travel through workpiece.

Economical "Gang" Climb Milling with High Speed Steel Cutters

Smooth, continuous chips prove that these Brown & Sharpe plain milling cutters are "climb milling" with top efficiency. Climb milling is used where work piece is difficult to hold, and for greater cutter life when milling tough steels and alloys.

Climb milling should be done only with cutters having rigid, sharp teeth and precision ground cutting edges. Brown & Sharpe High Speed Steel Cutters are PRODUCTIONEERED for longer life at high speeds—no matter what type of milling is performed. Get the most out of your milling machines: Maximum speeds and feeds with less horsepower, less downtime. For real production economy, always specify Brown & Sharpe PRODUCTIONEERED Cutters!

Write for 80 page Brown & Sharpe Catalog showing over 2300 High Speed Steel Tools and Accessories.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe

BROWN & SHARPE MFG. CO. • PROVIDENCE 1, RHODE ISLAND

STOCK OF OVER 3000 STANDARD TOOLS!
Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe-NELCO Distributor.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-180

sion. Frederick J. Rutland, who has been sales engineer at Norton's Chippewa, Ontario plant, became manager of sales engineering for the Electro-Chemical Div. Frank B. Huke, previously chief atomic products engineer, was appointed manager of atomic product sales, Refractories Div. Formerly assistant sales manager of the Refractories Div., George H. Powers was promoted to manager of distribution for the division.

V V V

At Pangborn Corp., the recently created position of manager, abrasive sales, has been filled by the appointment of James R. McConnell. He has been associated with the abrasive field for 10 years.

V V V

New manager of Flexloc sales for Standard Pressed Steel Co. is William M. Kerrigan. He formerly was in the company's Aircraft Products Div. At the same time, Frank R. Lindh, who has been a member of the SPS inside sales group, became assistant manager of Flexloc sales.

V V V

Chester S. Johns is new sales managar for Buhr Machine Tool Co. He formerly was associated with Cross Co.

anniversaries

More than 400 representatives of manufacturing companies in the United States as well as government officials joined Associated Spring Corp.'s Wallace Barnes Co. Div. at a banquet to mark the 100th anniversary of its founding. Founded in 1857 by Wallace Barnes, the company has had a diverse manufacturing history which has included the manufacture of spring steel hoops for crinoline skirts, the making of springs for muskets and powder horns during the Civil War, and springs for the vital functioning of many inventions, including player pianos, wind up phonographs, radios, television, and electronic computers.

V V V

Braun Gear Co., 245 Richmond St., Brooklyn, N.Y., is this year celebrating the anniversary of its 50th year in the gear industry. To mark the event, the company has prepared a colorful pamphlet describing its facilities and industrial background.

V V V

Ward Machinery Co., founded by William M. Ward during depression years, now is celebrating its 25th anniversary as a distributor for machines, tools and dies used in the sheet metal fabricating industry.

technical Shorts

A SIMPLE process to produce purer metals with a high melting point has been developed at Illinois Institute of Technology. In this method,, titanium, zirconium, chromium, hafnium, niobiou and vanadium are produced directly from their oxides, which are reacted with aluminum under conditions that cause complete removal of oxygen. Prior to this development, use of these easily oxidized metals was handicapped with high production costs and difficulty of producing sufficiently pure, ductile metals.

New Technique Produces Purer Metals

The technique has been patented by Dr. Lucio F. Mondolfo, director of metallurgical engineering at IIT.

* * *

SEVERAL informative films have recently been made available by industry. One of special interest to designers, specification writers and production men in metalworking industries is a practical picture produced by the Formed Steel Tube Institute. The 16mm sound film gives clear insight into structural advantages, manufacture, fabricating methods and uses of welded steel tubing in numerous applications. It is calculated to stimulate ideas on how to gain manufacturing economies through use of tubing. Copies of the film may be borrowed for company personnel showing from the institute, 850 Hanna Bldg., Cleveland 15, Ohio.

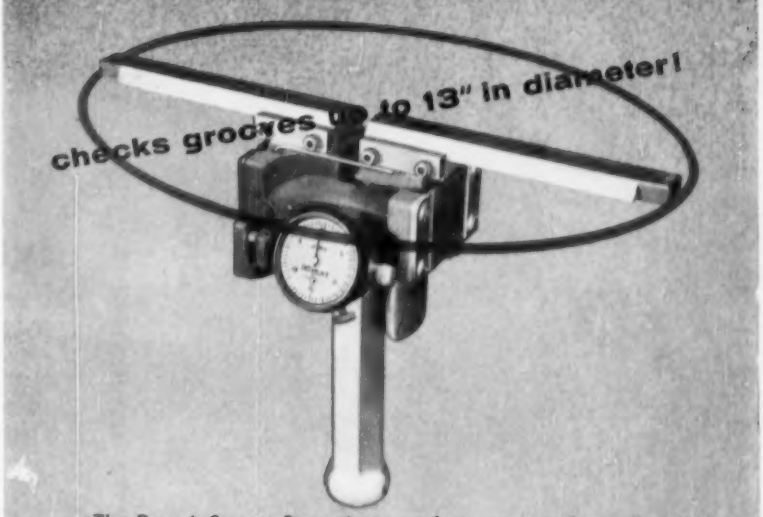
Informative Industrial Films Released

Where and how the modern grinding wheel is used throughout industry is graphically portrayed in a 16mm sound, color movie. Included in the film is a discussion of the factors that make up a grinding wheel and how they are expressed in a typical grinding wheel marking. Running time for this film, produced by Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa., is 24 minutes.

Mill and fabricator practices in finishing stainless and carbon steel are dramatized in the color film, "A Challenge for Steel." All finishing practices shown in the film, which was made at several production line locations, can be adapted to specific finishing problems. Among questions raised by the film are: Can prefinishing be done most economically and profitably in the steel mill or at the fabricating plant? Can a mill profit from strip grinding carbon steel and sell it as polished stock? Inquiries concerning this film, designed for in-plant showing, should be directed to Dept. F7-287, Minnesota Mining and Mfg. Co., 900 Bush St., St. Paul 6, Minn.

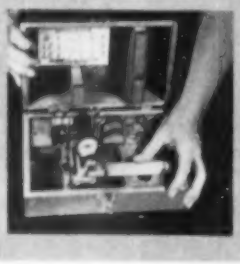
A 16mm color, sound film on "Tooling the Band Saw for Production" describes versatility of the band saw in accurate removal of metal in machining operations requiring shaping, slotting, splitting or facing. Examples are incorporated to typify machining applications that can be done quickly, accurately and economically. This 10-minute picture is available on loan from The DoAll Co., Des Plaines, Ill.

BRYANT GROOVE GAGE



The Bryant Groove Gage gives you fast, accurate inspection at low cost. With long segments, as shown, you can measure grooves up to 13" in diameter.

The standard Bryant Groove Gage kit includes four pairs of segments to check "O" ring grooves through 5" dia. and four pairs of segments to check snap ring grooves through 5" dia. Immediate delivery from stock.



Also available: Bryant bench gages to measure internal threads, external threads, concentricity and squareness of face, and portable gages for checking internal threads. Write for complete information.

Bryant Gage & Spindle Division

P. O. Box 620-J, SPRINGFIELD, VERMONT

Division of Bryant Chucking Grinder Company

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-181

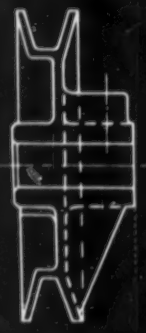
NEW design

OLOFSSON Precision Boring Machine gives added production advantages

OLOFSSON Model 30-012 Single End Precision Way Boring Machine

PROVIDES FAST, ACCURATE ROUGH AND FINISH BORING, FACING, CHAMFERING, TURNING AND GROOVING.

A TYPICAL APPLICATION



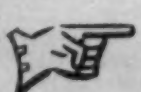
Finish bore, turn o. d., groove, and chamfer zinc die-cast pulley.

Rate of Production: 190 pieces per hour.

These 7 design features give you greater production efficiency . . .

1. New design provides low height to width ratio of spindles to ways.
2. Self contained hydraulic unit, separate from machine, for easy maintenance and elimination of heat problems.
3. Standard commercial hydraulic components throughout.
4. Nickel-iron, one piece ribbed base with integral fixture mounting pad and chip disposal basin.
5. Hardened and ground ways.
6. Conveniently located push-button control panel.
7. Forced feed lubrication.

FIND HOW THE 30-012 FITS YOUR REQUIREMENTS. WRITE FOR LITERATURE.



THE OLOFSSON CORPORATION

2731 Lyons Ave., Lansing, Michigan

MANUFACTURERS OF PRECISION BORING MACHINERY AND SPECIAL MACHINERY

Men at Work

Richard E. Krengel has left his post as manager of inter-plant production of Ex-Cell-O Corp. where he coordinated work of Canadian and American plants, to take on responsibilities as general manager of Ex-Cell-O Corp. of Canada, Ltd. in London, Ont.

At an executive meeting of Barnes Mfg. Co., **M. H. Pryor** announced he was relinquishing the office of presidency to became chairman of the board. **Fred B. Hout,** vice-president-sales for the past 12 years, was named president of the firm. **John A. Mintz,** a director and treasurer of Barnes, was appointed president of Barnes Holding Co., a unit of Barnes group of manufacturing plants.

Square D. Co. has named **Lawrence G. Maechtlen** as first vice-president. A director and vice-president of the firm since 1951, he has served as manager of its Western Div. for the past three years.

Walter E. Thill is now chief engineer of the recently established service engineering department of Federal-Mogul Service. He will be concerned with investigating product replacement problems encountered by Service sales personnel or by customers.

Two officer appointments at the Linde Co., Div. of Union Carbide Corp. involved **L. I. Dana** and **David Swan.** Dr. Dana, who has been vice-president-research since 1951, was named vice-president-research and development. Mr. Swan, formerly director of research of Metals Research Laboratories, Electro Metallurgical Co. (another division of Union Carbide), was appointed director of research of Linde.

Famco Machine Co. has announced promotion of four men to key executive positions. **John E. Glebs** was made vice-president and controller, **Lowell Jensen** became works manager, **Bernard Matter** was appointed chief engineer, and **Ronald Ashenfelter** was named chief purchasing agent. Mr. Jensen and Mr. Bernard are members of ASTE's Racine chapter.

New vice-president in charge of production and engineering for Skidmore-Wilhelm Mfg. Co. is **Carl E. Sutherland Jr.** Associated with the firm since 1948, he has held the post of general superintendent.

Appointment of **Michael A. Horlak** to the post of new product research and development engineer has been announced by Rotor Tool Co.

At Motch and Merryweather Machinery Co., **Alvin J. Jones** has been named director of engineering. A veteran of 21 years experience in the machine tool field, he has been chief engeneer with Landis Tool Co.

New general manager of Associated Spring Corp.'s Ohio Div. is **John A. Wentworth.** Formerly assistant Spring works manager of the corporation's Wallace Barnes division, he succeeds **Harry B. Dauphinais** who was recently appointed general manager of the William D. Gibson Co. division.

Announcement from The Fosdick Machine Tool Co. has made public the appointment of **Frank J. Fields** as works manager. He formerly was executive vice-president and general manager of the Sidney Machine Tool Co.

The R. K. LeBlond Machine Tool Co. has revealed appointment of **Harry C. Kemper** as chief engineer. Mr. Kemper, who has been with LeBlond since 1923, has played a major role in designing the company's crankshaft and engine lathes.

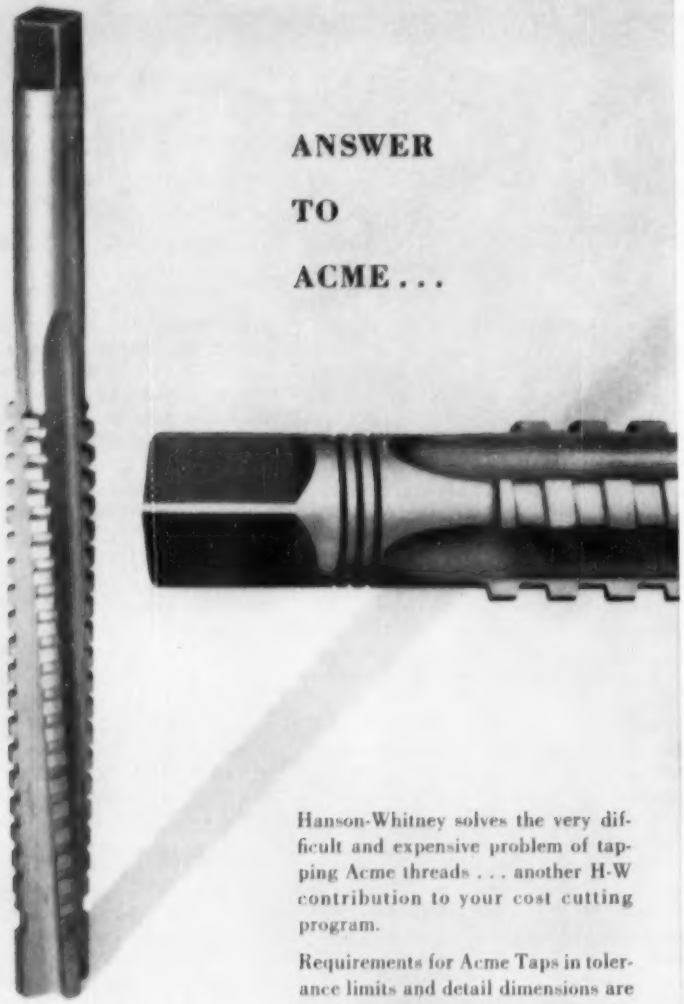
At the same time, the company announced that Harold J. Siekmann, vice-president and chief engineer, has retired after 47 years of service.

Matthew J. Betley was named president of Titeflex, Inc., a subsidiary of Atlas Corp. Experienced as a senior executive in manufacturing corporations for the past 15 years, he formerly was a consultant to Gar Wood Industries.

Richard C. Diehl was elected vice-president of operations for Universal-Cyclops Steel Corp. He previously was president of Chase Brass and Cooper Co., and earlier was with Wheeling Steel Corp. and Armco Steel Corp.

Charles M. Albritton recently became vice-president in charge of manufacturing for Huck Mfg. Co. Mr. Albritton, who has been plant manager at Huck, formerly served with Nash Motors in Kenosha, Wis. and with Kaiser Frazer.

Paul W. Leming is executive vice-president of Van Norman Industries, Inc. in charge of manufacturing and engineering. He formerly was works manager of King Machine Tool and Elmes Engineering Divs. of American Steel Foundries.



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Hanson-Whitney solves the very difficult and expensive problem of tapping Acme threads . . . another H-W contribution to your cost cutting program.

Requirements for Acme Taps in tolerance limits and detail dimensions are vastly diversified. For the proper solution to your Acme tapping problems send us the following data: nature of material, size and length of thread, single or multiple, a print of part to be tapped.

Hanson-Whitney stands ready to assist in all threading problems, offering complete home and field engineering assistance backed by local distributor's rapid service for the entire line of H-W standard Taps, Hobs, Cutters and Gages. Write for catalogs —full information.

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TAPS : THREAD GAGES : HOBS : CENTERING MACHINES : THREAD MILLING MACHINES AND CUTTERS

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American Bosch Arma Corp. revealed appointment of **Walter C. Robertson** as a vice-president of the company responsible for marketing and servicing of defense products as well as contract administration.

Chrysler Corp. has announced appointment of **John von Rosen** as director of manufacturing engineering. He has been director of plant engineering for the company since 1952.

P. H. Richey, executive vice-president of Wagner Brothers Inc., has been named president and treasurer of the company's recently acquired, wholly-owned subsidiary, Automatic Molding Machine Co.

Robert E. Fleming was elected executive vice-president of the Industrial Heating Equipment Association to succeed Carl A. Ipsen who retired. Mr. Fleming was an associate in Machine Steel Products Corp., President of R. Fleming and Co., and partner in Ajax Investment Co.

William M. Goldsmith, secretary-treasurer of the Dave Chapman Industrial Design office in Chicago, has been elected president of the American Society of Industrial Designers.

Appointment of **Joseph E. Praser** as general superintendent of its Cleveland steel service plant has been announced by Joseph T. Ryerson & Son, Inc. He replaces **James J. Connaughton** who was named assistant to the general manager. Mr. Connaughton has been associated with Ryerson and its predecessor company in Cleveland for the past 38 years.

Two executive assignments at E. W. Bliss Co. involved **William Staecker,** who became assistant manager of engineering for the Press Div., and **Alfred Drain** who succeeds Mr. Staecker as chief engineer of the Canton Div. Mr. Drain previously was project engineer.

William W. Kearney was made manager of production control for The Baker-Raulang Co. Prior to this appointment, he was manager of planning and materials at the electronics division of The Otis Elevator Co.

Cox Sales & Engineering Co., Inc. has announced appointment of **Ernest N. DeLalla** as vice-president in charge of sales. He has been with the company for eight years as sales engineer and sales manager.

Richard R. Hydeman has been elected vice-president-manufacturing by Taylor Fibre Co. to succeed Harold C. Steadman who resigned. Mr. Hydeman has been treasurer of the company since January, and prior to that was assistant to the president.

who's meeting and where

Dec. 1-6. American Society of Mechanical Engineers. Annual meeting. Statler and Sheraton McAlpine hotels, New York City. For other data contact ASME headquarters, 29 W. 39th St., New York 18, N.Y.

Dec. 5-6. Industrial Engineering Conference, sponsored by Illinois Institute of Technology. Illinois Institute of Technology campus, Chicago, Ill. Inquiries regarding the conference should be directed to Raymond D. Meade, conference coordinator, IIT, 3300 S. Federal St., Chicago 16, Ill.

Dec. 5-7. National Association of Manufacturers, Congress of American industry, Waldorf-Astoria Hotel, New York City. Complete data may be had from association headquarters, 14 W. 49th St., New York 20, N.Y.

Dec. 8-11. Eastern Joint Computer Conference, sponsored by Institute of Radio Engineers, American Institute of Electrical Engineers and Association for Computing Machinery. Details are available from Morton M. Astrahan, IBM Corp., San Jose, Calif.

Jan. 6-8. Reliability and Quality Control, fourth national symposium. Hotel Statler, Washington, D. C. Complete data is available from Richard M. Jacobs, RCA Bldg. 108-2, Moorestown, N.J.

Jan. 27-30. Plant Maintenance & Engineering Show and Conference. International Amphitheatre, Chicago, Ill. For complete information, contact exposition managers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Jan. 28-31. Society of Plastics Engineers, Inc. 14th annual technical meeting, Sheraton-Cadillac Hotel, Detroit, Mich. Details may be obtained from C. H. Whitlock, C. H. Whitlock Associates, 21655 Coolidge Hwy., Oak Park 37, Mich.

Jan. 30-31. American Society for Engineering Education, relations with industry division, 10th annual College-Industry Conference, University of Michigan, Ann Arbor, Mich. Other information is available from U of M College of Engineering, 255 West Engineering Bldg., Ann Arbor, Mich.

Feb. 3-4. Instrument Society of America. Conference on progress and trends in chemical and petroleum instrumentation, Wilmington, Del. For more data write to H. S. Kindler, director of technical programs, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

Feb. 4-6. The Society of the Plastics Industry, Inc., Reinforced Plastics Div. 13th annual technical and management conference and industry exhibit, Edgewater Beach Hotel, Chicago, Ill. Contact society office, 67 W. 44th St., New York 17, N.Y.

Feb. 18. Rochester Society for Quality Control. 14th annual quality control clinic, War Memorial, Rochester, N. Y. For details, write to Edward F. Winterkorn, Eastman Kodak Co., Navy Ordnance Div., 50 Main St. West, Rochester 14, N.Y.

Mar. 12. Pressed Metal Institute. Spring technical meetings, Sheraton-Cadillac Hotel, Detroit, Mich. For details write to institute office, 3673 Lee Rd., Cleveland 20, Ohio.

Mar. 16-22. American Society of Mechanical Engineers. Nuclear congress, International Amphitheatre, Chicago,

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You always get this . . .
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CIRCLE R quality in fine saws and other circular metal cutting tools is controlled—and cost is lowered—with Magnaglo Inspection. For you, our use of this scientific method practically eliminates your down time due to usual defects in cutting tools.
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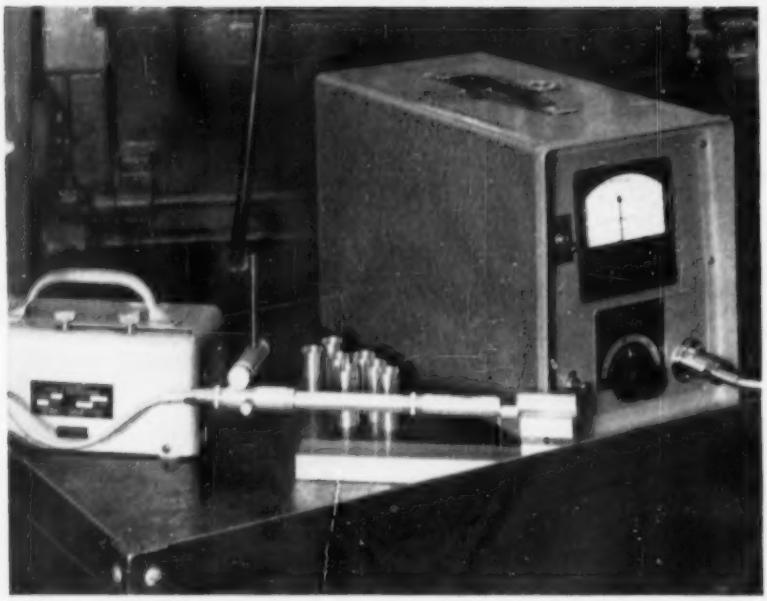
PROFILOMETER® GROUP II



An Unusually Handy Combination for Dependable Roughness Measurement

THIS equipment will measure the microinch roughness of every surface that *needs* to be measured, in most plants — with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop men — and includes the following items:

AMPLIMETER — Shows all roughness measurements from 0 to 1000 microinches, on an easy-to-read meter. Factory-calibrated for dependability.

TYPE LJ TRACER — Measures on OD's as small as 1/8" — ID's as small as 1/4" — flats — tapers — narrow splines. Passes through a 3/4" hole.

MOTOTRACE AND LINKARM — Give the Tracer a *steady support* and *smooth motion,* essential to dependable measurement. No operator skill required.

FREE BULLETIN LT17 gives details. Write for it! ● And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

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Ill. More information is available from society offices, 29 W. 39th St., New York 18, N.Y.

Mar. 17-18. Steel Founders' Society of America. 56th annual meeting. Drake Hotel, Chicago, Ill. Request more data from society headquarters, 606 Terminal Tower, Cleveland 13, Ohio.

Mar. 17-21. Engineers Joint Council. Nuclear Congress, sponsored by 30 national groups, Internationaal Amphitheatre and Palmer House, Chicago, Ill. For information address congress manager, American Institute of Chemical Engineers, 25 W. 45th St., New York, N.Y.

Apr. 13-18. American Chemical Society. Spring meeting, San Francisco, Calif. Send inquiries to society offices, 1155 Sixteenth St., N.W., Washington 6, D.C.

Apr. 14-18. American Welding Society, Inc. Annual national meeting and welding show with ASME conference. Statler and other hotels, St. Louis, Mo. Write to society headquarters, 33 W. 39th St., New York 18, N.Y. for more details.

Apr. 16-25. British Electronics Show, Olympia Hall, London, England. Inquiries or space applications may be addressed to the organizers: Industrial Exhibitions Ltd., 9 Argyll St., London, W.1, England.

Apr. 22-24. American Society of Lubrication Engineers. Annual meeting and exhibit, Hotel Cleveland, Cleveland, Ohio. Write for more data to society office, 84 E. Randolph St., Chicago 1, Ill.

May 1-8. American Society of Tool Engineers. 26th annual meeting and 1958 Tool Show. Bellevue Stratford, Sheraton and Benjamin Franklin Hotels and the Philadelphia Convention Center. For details, contact Society headquarters, 10700 Puritan Ave., Detroit 38, Mich.

May 5-9. American Society of Training Directors. 14th annual conference, Sheraton-Park Hotel, Washington, D.C. For further information write to the conference, ASTD, P. O. Box 958, Washington 4, D.C.

June 22-27. American Society for Testing Materials. 61st annual meeting and apparatus exhibit, Hotel Statler, Boston, Mass. Complete information is available from society office, 1916 Race St., Philadelphia 3, Pa.

Trade Literature

for free booklets and catalogs—use convenient request card, page 173

Thread Rolling

Three data pamphlets describe advantages, and applications of new, small size Model B8 thread rolling attachment for use on small automatic screw machines. Illustrated with drawings. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass. **L-12-1**

Grinding of Steels

Informative 24-page brochure, "Tool Room Grinding of Alloy, High-Speed and Die Steels," covers 22 areas in the field with short, factual copy, clarified by charts and pictures. Quick reference charts provide information on grinding recommendations and grindability of steels in the toolroom.

Adv. Distribution Section., The Carborundum Co., P.O. Box 477, Niagara Falls, N.Y. **L-12-2**

Taps, Dies and Gages

Spiral bound, 64-page bulletin gives handbook type information such as how to use pipe thread gages, product pitch diameter limits, thread gage tolerances, pertinent standards tables, tap nomenclature and other useful engineering data; also gives specific dimension and specifications for line of taps, dies and gages. Request only on company letterhead directly from Winter Brothers Co., Rochester, Mich.

Cutoff Machines

Illustrated 12-page brochure provides detailed descriptions of construction and special features of company's cutoff machines with automatic loaders, hot spinning machines and safety drill tables. Modern Machine Tool Co., Jackson, Mich. **L-12-3**

Surface Plates

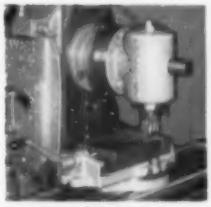
Black, pink and gray granite surface plates are compared as to physical properties and other characteristics in paper by Dr. Richard Merriam of the University of Southern California; serves as aid in evaluating plates and other inspection equipment made of granite material. Collins Microflat Co., 3249 W. El Segundo Blvd., Hawthorne, Calif. **L-12-4**

Stainless Steel

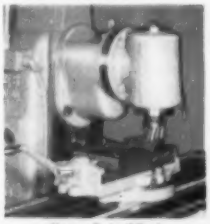
Descriptions, chemical composition, strength factors, physical properties and typical applications for broad range of stainless steels covered in illustrated 32-page technical digest. Adv. Dept., Sharon Steel Corp., Sharon, Pa. **L-12-5**

Investment Castings

Comprehensive brochure contains information on advantages of investment casting process; outlines care and precision requirements and explains various steps in manufacture; illustrated. The Hitchiner Mfg. Co., Milford, N. H. **L-12-6**



Heavy Duty Vertical Milling Attachment



Heavy Duty Offset Vertical Milling Attachment

Universal Milling Attachment

Toolmakers Overarm

Heavy duty attachments increase versatility of dependable, low-cost

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A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS. Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.

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Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.
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Quick-Change Holder

Description of features and advantages of new heavy duty quick change holder included in 104 page catalog of line of Kwik-Switch adaptors. Universal Engineering Co., Frankenmuth, Mich. **L-12-7**

Motor Starters

Comprehensive data on new 100 Line NEMA Size 0 and 1 magnetic motor starters presented in 20-page Bulletin GEA-6611; shows how product's design contributes to fast installation, easy inspection and maintenance, dependable operation etc.; gives dimensions for open and enclosed forms.

General Electric, Schenectady, 5, N.Y. **L-12-8**

Grinding Wheels

Well illustrated Booklet PG-341, "Cincinnati Centertype Grinding Wheels," describes features and applications of these wheels; includes table of suggested grinding wheel gradings for various centertype grinding operations. Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati 9, Ohio. **L-12-9**

Blind Bolt Fasteners

Well illustrated 8-page brochure on blind bolts for high strength blind fastener applications covers design characteristics, advantages, applications and installation.

Hi-Shear Rivet Tool Co., 2600 W. 247th St., Torrance, Calif. **L-12-10**

Preventative Maintenance

Chart for "Preventative Maintenance for the Gisholt Ram Type and Saddle Type Turret Lathes" is divided into three parts; cleanliness, lubrication, and inspection and adjustment. Under each division is a column for the item on the machine requiring attention, giving frequency with which service should be performed, and proper lubrication for various units of the lathes. Available as large wall chart or folded and punched to fit a standard 3-ring binder.

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis. **L-12-11**

Titanium

Pocket-size 24-page "Fact File" on titanium serves as reference booklet on titanium's advantages; physical, mechanical and corrosion properties; metallurgy; and also contains production information on machining, forming and welding; tables provide pertinent data in condensed form. Mallory-Sharon Titanium Corp., Niles, Ohio. **L-12-12**

Magnesium and Aluminum

Extensively illustrated Catalog 57 lists physical properties and conforming specifications for magnesium and aluminum alloys; listings include alloys for sand castings, permanent mold and rare earth alloys. The Wellman Bronze and Aluminum Co., 12800 Shaker Blvd., Cleveland 20, Ohio. **L-12-13**

Copper Addition to Steel

Engineering report on "The Effect of Copper, Abnormally Heavy Drafts, Furnace Treatment and Die Practice on Stressproof Steel Bars," discusses in detail the chemistry of raw material used in company's production of steel and explains results of controlled addition of copper; outlines tests used to determine wear resistance. Graphs, charts and tables serve to clarify discussion. Adv. Dept., La Salle Steel Co., P.O. Box 6800-A, Chicago 80, Ill. **L-12-14**

Welding

Information on metals and electrodes, four essentials of proper welding procedures, the fillet weld, types of joints, typical welding positions, welding symbols, causes of common welding troubles and their solutions and many other points in arc welding presented in 60-page Welders' Vest Pocket Guide EW-201, "How to Get Better Welds." Includes explanation of AWS classification numbers and a comparative index of welding electrodes. Hobart Bros. Co., Troy, Ohio. **L-12-15**

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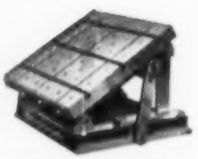

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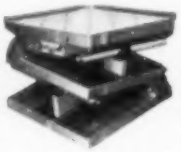

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Lead Error

Well illustrated 16-page monograph discusses the anatomy of lead error (the deviation spacing of successive turns of thread), its mathematics, its most common causes and the means for detecting and preventing it as a major cause of fastener assembly problems. This is the second booklet in a series on screw thread fundamentals. Standard Pressed Steel Co., Jenkintown, Pa. **L-12-16**

Miniature Bearings

Twenty-four page catalog outlines type and functions of miniature precision ballbearings; describes lubrication, handling and packaging, and discusses shaft and housing fits. Dimensional code charts and torque conversion charts plus charts and discussions on inspection correlation, clearances, tolerances and preselection also included. Miniature Precision Bearings, Inc., Keene, N.H. **L-12-17**

Carbide Tools

Picture index easily identifies each product in this 56-page catalog on carbide tips, tools and inserts; die cut pages permit quick reference of desired section; also includes complete grade selection chart. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. **L-12-18**

Dust Collectors

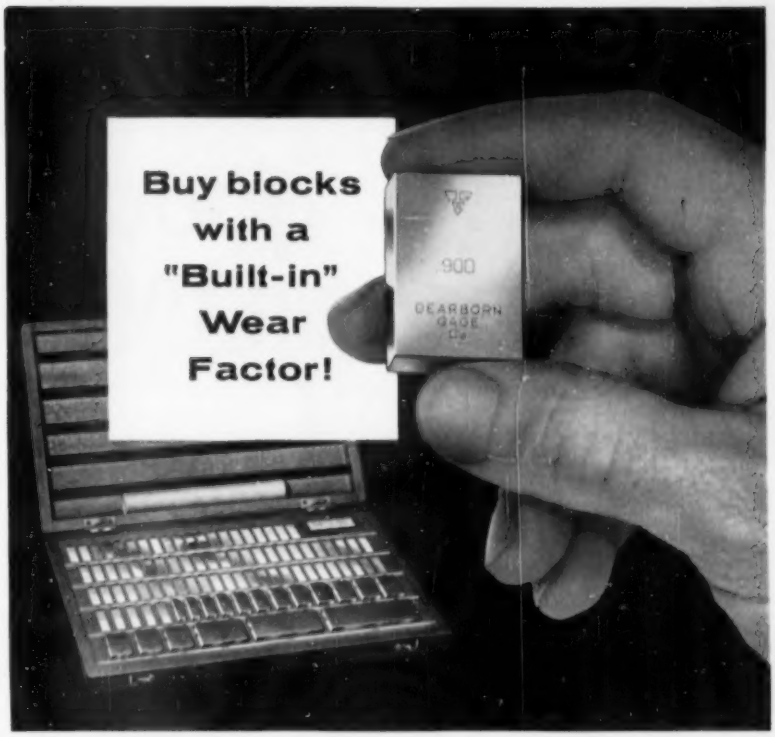
Extensively illustrated Catalog No. 815 shows applications for new Dus-Kolector and MistKoletorunits which can be used with dirt and mist producing machines located too far away to be connected to a central collecting system. Discusses features, advantages, gives dimensions and specifications and describes available accessories. Adv. Dept., Hammond Machinery Builders, Inc., 1661 Douglas Ave., Kalamazoo, Mich. **L-12-19**

Grinding

Sixteen page, illustrated Catalog D-57 describes company's 14 and 18 in. swing plain cylindrical grinding machines; includes dimensions and specifications. Landis Tool Co., Waynesboro, Pa. **L-12-20**

Valves

Extensively illustrated Catalog 262 presents information on new Flo-Pilot valves available in five basic models, for remote control of master valves, directional control of small single acting cylinders and for shut-off. Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill. **L-12-21**



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good READING

ENGINEERING PROPERTIES AND APPLICATIONS OF PLASTICS—*By Gilbert Ford Kinney. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $6.75. 286 pages.*

This book is written for those who work with plastics and for those who require background information for the proper utilization or specification of these materials. The various plastics are described separately more or less in order of increasing complexity. A unified treatment permits the principles, concepts and terminology to be established in the simpler cases, and utilized in treatment of the more complex materials.

Emphasis is placed on an understanding of the fundamental nature of plastics. However, good design and successful utilization of plastics introduce some considerations not ordinarily of concern with other types of materials.

Separate chapters describe methods for fabrication, as well as mechanical, electrical, optical and thermal properties of these materials. Also provided is an abbreviated survey of the type reactions of organic chemistry.

In all, the book is a clear, unified description of the major characteristics of plastics.

SELECTION OF MANAGEMENT PERSONNEL —*By M. Joseph Dooher and Elizabeth Marting. Published by the American Management Association, Inc., 1515 Broadway, New York 36, N. Y. Price $15. Printed in two volumes; Volume I, 542 pages. Volume II, 364 pages.*

There is no shortage of run-of-the-mill aspirants for managerial jobs, but there assuredly is a shortage of candidates of the caliber needed today. Executive vacancies have too commonly been filled in arbitrary fashion or by completely subjective selection methods. It has been too often assumed

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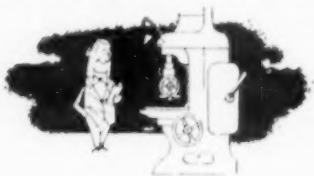

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OF TOOL ENGINEERS

that men who have succeeded in minor executive roles should continue to move up the management ladder. Companies are only beginning to realize that the selection and development programs that have improved plant foremanship so tremendously during recent years can be extended with good results to upper management groups.

Volume I gives an appraisal of the problems of selecting managers and discusses such problems as: the selection of supervisors, the selection of executives, and practical aspects of executive and supervisory selection.

Volume II discusses company practices in management selection. This volume is divided into three parts: Part I, programs for selecting and training supervisory candidates; Part II, programs for selecting primarily first-line supervisors and foremen for actual job openings; and Part III, programs for selecting and developing managers, generally from first-line supervisors up.

There are nineteen chapters in Volume II and each is a factual report of an American company. The practices dscribed, while falling into definitely broad patterns, reflect the individuality of problems and approaches that might be expected of a diversified group of companies.

CREATIVE PROBLEMS FOR BASIC ENGINEERING DRAWING—*By Matthew McNeary, Ernest R. Weidhaas and Elizabeth A. Kelso. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y.*

This is essentially a workbook for beginning engineering students. However, it is a result of the 1952-1955 A.S.E.E. Report on the evaluation of engineering education. Through the report, it was found that in the haste to teach essential theory and techniques in a limited amount of time, teachers felt obliged to neglect an opportunity to exercise the latent creative ability of the student at an early stage of his professional education.

This book covers two specific problems: a thorough presentation of theory and necessary skills, and an introduction to situations demanding creative decisions.

The workbook will also be very useful to engineers who have been away from a drawing board for a long time and wish to familiarize themselves again with the fundamentals of mechanical drawing. Text problems are given, and in the back of the book are: a 20 x 20 cross-section graph sheet, isometric sketching sheets, ¼-in. cross-section sketching sheets, tracing sheets and buff drawing sheets.

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Let's LAUGH a minute

Of course everyone knows that heat treating today has become one of the most serious technical and vital functions of the current metalworking activity. But a smile and laughter are still also important and the cartoons shown here are for that purpose.

We hope they make you grin and when it's heat treating services you require or skilled, technical advice about part design or heat treatability, check with

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or any member listed below.

Sound Familiar?
SMEARCASE, THE PRODUCTION MAN, SCHEDULES A JOB THROUGH HIS PLANT WITH TIME TO WASTE!
LET'S SEE... PLENTY OF TIME FOR A GOOD JOB ON OPERATION 1... NUMBER 2 SHOULD BE ABLE TO OOZE ALONG NICELY... AMPLE TIME FOR OPERATION NUMBER 3... THEN OUT IT GOES FOR HEAT TREATMENT
PRODUCTION SCHEDULE
OPER. #1
OPER. #2
OPER. #3
BUT... WHEN THE HEAT TREATER GETS IT... IT'S IN AN AWFULLY GREAT HASTE!
SMEARCASE! HOW'S THAT JOB COMING? TIME'S RUNNING OUT!
FINE, BOSS! I GOT IT TO THE HEAT TREATER 10 MINUTES AGO, I'M CHECKING WITH THEM NOW!
HELLO, ABC HEAT TREATING?
WHAT? NOT THROUGH WITH OUR JOB? DO YOU REALIZE WE HAVE A TIGHT SCHEDULE? TRYING TO MAKE ME LOOK BAD, HUH?.. BLAH, BLAH, BLAH...

Sound Familiar?
CARELESS MILFORD IS NOT PARTICULAR ABOUT THE PARTS HE LENDS HIS FOR HEAT TREATING
BOY!... TAKE A LOOK AT THIS CASTING!!
...OFF SIZE, WICKED, CRACKED AND WHAT HAVE YOU. HOW DID IT EVER GET OUT OF THEIR PLANT... OR DON'T THEY CARE?
Inevitable Heat Treating Co.
BUT... WHEN HE GETS THEM BACK... WHAM! LOOK WHO GETS THE BLAME!!!
CALL YOURSELVES METAL TREATERS? HAH! YOU SURE GAVE OUR CASTINGS THE 'TREATMENT'! - THEY GO OUT OF HERE 100% PERFECT,... AND WHAT HAPPENS? DO YOU DROP 'EM OFF THE ROOF OR JUST RUN A TANK OVER THEM? IF YOU HAVE NO CONSIDERATION FOR A CUSTOMER'S PRODUCT I'LL JUST HAVE TO...

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Elizabeth, New Jersey
Anderson Steel Treating Co.
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Benedict-Miller, Inc.
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Bennett Heat Treating Co., Inc.
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Cook Heat Treating Co. of Texas
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Dominy Heat Treating Corp.
Dallas, Texas
Drever Company
Philadelphia 23, Pennsylvania
Greenman Steel Treating Company
Worcester 8, Massachusetts
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MTI
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Los Angeles 38, California
Ipsenlab of Rockford, Inc.
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Newark, New Jersey
The Lakeside Steel Improvement Co.
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Metallurgical, Inc.
Minneapolis 14, Minnesota
Metallurgical, Inc.
Kansas City 8, Missouri
New England Metallurgical Corp.
South Boston 27, Massachusetts
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Apalachin, New York
Paulo Products Company
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Pittsburgh Metal Processing Co., Inc.
Pittsburgh 19, Pennsylvania
The Queen City Steel Treating Co.
Cincinnati 25, Ohio
J. W. Rex Company
Lansdale, Pennsylvania
Stanley P. Rockwell Company
Hartford 12, Connecticut
Scott & Son, Inc.
Rock Island, Illinois
Standard Steel Treating Co.
Detroit 10, Michigan
Syracuse Heat Treating Corp.
Syracuse, New York
Temperature Processing Co.
North Arlington, New Jersey
Winton Heat Treating Company
Cleveland 10, Ohio

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tech digests

Effective utilization of engineers

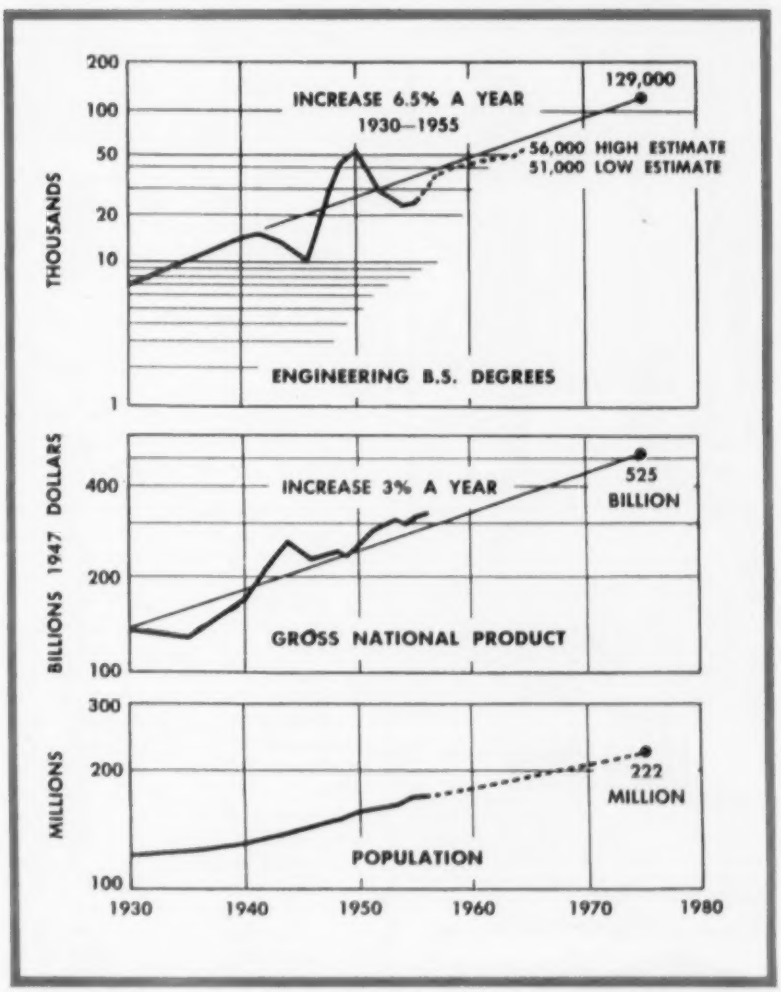
Tech Digests

By Alfred Iddles
President
The Babcock and Wilcox Co.
New York 17, N. Y.

THERE ARE SEVERAL BASIC REASONS why we should be considering the more effective utilization of engineering personnel. Efficiency is always a desirable objective. We have an insufficient supply of engineers and furthermore, there is strong evidence that we will be plagued with this shortage for at least the next five and possibly the next ten years unless we in management do learn to use this type of personnel more effectively.

That there is a shortage of engineers needs no elaboration—the problem has received wide publicity. We do not, however, have any precise indication of the magnitude of the shortage which underlies the evidences of the current demand. That a marked increase in demand for engineers, rather than a failure to produce more engineers, is the major factor in this shortage, is obvious when we consider the increase in engineering graduates during the past decade. There were approximately 320,000 engineering graduates in the past ten-year period, 1947 to 1956. There were 120,000 in the ten years before World War II, 1932 to 1941—an increase of more than 2½ times. The number of engineers counted by the Census shows a similar trend, 535,000 in 1950 as compared with 260,000 in 1940.

It can be argued that the increasing ratio of engineers to workmen is a measure of our material progress and success. Therefore, as our population increases and our gross national product increases, the need for engineers increases at an ever more rapid rate. In these times of full employment and active struggle for a little higher standard of living, we should be measuring



Trends in engineering B.S. degrees, gross national product and population. Source: National Science Foundation, U. S. Department of Commerce.

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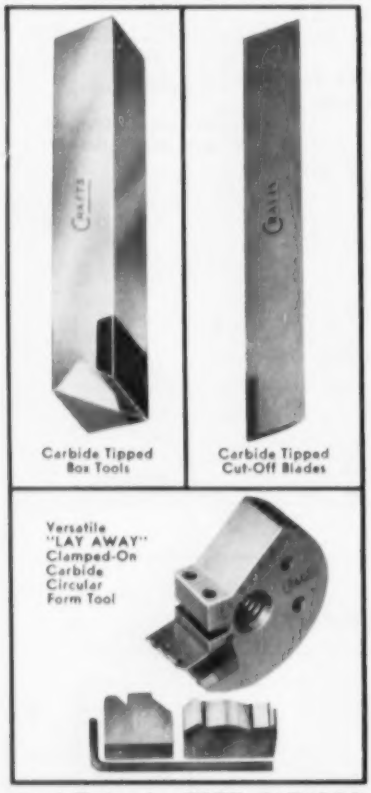

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our present status and considering what the future will require.

The number of engineers graduated per year, plotted against population and plotted against gross national product at constant 1947 prices, is shown in the accompanying chart.

Since 1930, population has increased from 125 to 168.1 million—34 percent. Gross national product measured in constant 1947 dollars has increased from 135 to 330.4 billions—145 percent. Number of first degree engineering graduates has increased from 7 to 26 thousand—370 percent. Trends to 1970 indicate that engineering graduates will continue to increase faster than the rate of increase in gross national product.

Thus, with these prospects of shortages of engineering personnel facing us for five or ten years, it is well worth our while to supplement the efforts of our educational institutions with some additional effort of our own. If we could improve the efficiency in utilization of the estimated 700,000 engineers we have today, by only five percent, this year, we would add to our effective engineering forces as much as all the new graduating classes of 1957.

One thing I am sure we will all be interested in is how we can better relieve our trained engineers from non-engineering duties so that they may devote more time to technical and creative work.

We can make more use of the administrative assistant, with sound training and broad authority in the administrative aspects of the office. We can make more use of technicians to help the trained engineer in the more routine, or less complicated aspects of his technical work, and we can train and encourage our engineers in these positions to be less hesitant in delegating work to their assistants and show them the value of conserving their time for work which only they can do.

In this period, it does not make sense to waste talent by misconceived notions of economy in research facilities, and having our best brains spend time on trivia—such as trouble shooting minor mechanical bugs in lab equipment, and improvising equipment which could be obtained from any machine shop. A top-to-bottom re-examination of equipment—with an eye to bringing these facilities up-to-date—is one of the most immediate ways at our disposal to ease the pinch of scientific manpower.

Another source of inefficiency and poor utilization of engineers has to do with artificial barriers that exist within industry. It will be impossible, at least for the near term period, to meet all the demands by hiring new college graduates. With the absolute decrease in the number of young people in the 18-21 age group from whom to draw all of the kinds of special trained workers, we might consider changing some of our current employment practices. Two specific areas offer possibilities and opportunities; the better utilization of trained women by industry, and the postponement of retirement of competent older workers.

Effective utilization of engineers also involves a genuine awareness of the problems of motivation and morale. These matters are much discussed these days, not only with regard to engineers but as related to all employees. Motivating a man to higher efforts seems to be essentially a process of giving him more individual attention. Such attention takes time. But so does hunting for engineers.

From a paper presented at a conference on Effective Utilization of Engineering Personnel, Labor and Industrial Relations Center, Michigan State University, Lansing, Mich.

▼ ▼ ▼

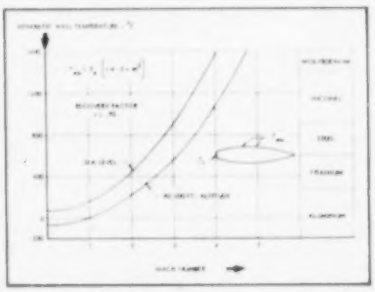
Steel Alloys for Supersonic Aircraft

By Dipl. - Ing. Alf Fridtjof Ensrud

Research Specialist
Lockheed Aircraft Corp.
Burbank, Calif.

The increase in aircraft speed made possible by the development of efficient jet engines brought with it the problem of kinetic heating, as shown in the accompanying figure. The most serious effect of the increase in temperature associated with high speed flight is the gradual deterioration of the mechanical properties of the aircraft materials. The concurrent loss of strength and stiffness has to be compensated by added structural weight. In some in-

Aerodynamic heating of surface skins for flight at sea level and 40,000 feet.



stances, at the higher Mach numbers, the possibility of cumulative creep deformations must be guarded against by a further reduction of the allowable stresses. Besides, a nonuniform temperature distribution within the structure may add appreciable thermal stresses to those induced by the flight loads. At present, high-strength steel alloys appear to offer a practical solution to heating problems. At the same time, these alloys are more difficult to work than light weight metals.

After the steel sheets, forgings, castings, extrusions and other semifinished products supplied by the various vendors arrive at the plant of the air-frame constructor, much additional work must be done.

Sheets and plates have to be cut to shape, stretched, drawn or joined, then hardened and cleaned prior to the assembly. Tapered sheets may have to be ground or sanded.

Controlled heat treatment without resulting warpage and embrittlement poses another serious challenge. New cycles with intermittent stretching operations have shown some promise in this respect. Parts made at Lockheed from material treated in this manner were very accurate as to contour and fit and could even be dimpled for riveting in spite of a heat treat equal to 250,000 psi.

Better and more economical cleaning methods must be developed to remove surface corrosion and oxide film caused by the various heat treat operations without embrittling the material.

While at present hot extruding of steel aircraft shapes is limited to small sections falling within a seven-inch diameter enclosure, many future possibilities are indicated by existing practical applications. Further study is required, however, to produce extrusions with closer tolerances in order to reduce material and machining cost.

An extensive program is proposed by Lockheed to investigate the merits of flashwelding in the fabrication of structural angles, tees, integral stiffened panels or intricate fittings from super-strength steel alloys. Considerable experience is already available in flashwelding larger structural components and it is quite possible that the superior joint efficiency might make flashwelding a significant method of assembling stiffening elements. Another method of great potentials in the fabrication of integrally stiffened panels, as waffle grids and other forms of sculptured skins, is chemical milling.

From a paper presented at the National Aeronautic Meeting, Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

Maintenance Operations for the Plant of the Future

By George J. Martin

Manager
Mechanical Div.
National Biscuit Co.
New York, N. Y.

The accelerating cost of plant maintenance has been a subject for careful analysis by the majority of executives responsible for plant management. As more automatic machinery is introduced to quicken the production tempo, to make up for limited available manpower, and to reduce product cost, the maintenance function assumes a far greater importance. To bring this point out more clearly, the cost of all industrial maintenance in 1952 was over $11 billion; by 1956 it is estimated to reach $22 billion annually.

Another indication of the impact of mechanization and automation in recent years is reflected in continually increasing plant investment per employee. The present average for manufacturing is approximately $12,000 per employee. This is more than double what it was ten years ago. In the chemical industry it is $19,000 per employee. DuPont has indicated that its average is $25,000 per employee and the figure is even higher in its newer plants. Refineries have an investment of upwards of $70,000 per employee.

The transition from plants with manually operated and controlled equipment to the modern present day highly mechanized automatic plants has been very rapid and the pace is constantly

5 Basic Reasons why
MARVEL HACK SAWS
CUT-OFF MORE ACCURATELY...

The consistently accurate performance of MARVEL Heavy Duty Hack Saws is no accident. MARVEL engineers knew, many years ago, that to produce and maintain accurate cutting-off, a hack saw must be designed and built like a fine machine tool.

Some of the basic design principles built into the modern MARVEL Hack Sawing System that makes it the most accurate cutting-off method you can use are:

1. V-Way Design...Greater Rigidity

Upright and Saddle are precision machined and fitted to form a rigid, integral unit capable of withstanding any cutting load with no deflection or side movement.

2. Anti-Friction Bearing Construction

Anti-friction ball or roller bearings are used at all load carrying points. Even the strongly braced saw frame reciprocates on heavy duty, fully enclosed preloaded ball bearings which provide permanent, frictionless rigidity and true-running, straight line cutting strokes.

3. Minimum Blade Frame Reach

Close-coupled design and crank lever action of MARVEL Saws keeps the saw frame and blade reach very short in relation to the vertical V-ways on which the unit is mounted. This insures optimum rigidity, even under the most severe operating conditions.

4. Positive Relief Blade Lift

On the return stroke, positive relief lift raises the blade to provide proper and "cushioned" lead-in on the next cutting stroke. This prolongs blade sharpness, life and accuracy.

5. Rigid Cutting Tool

Cutting-off accuracy requires a rigidly held, relatively short cutting tool. MARVEL Unbreakable High-Speed-Edge Hack Saw Blades, which combine a narrow high speed steel cutting edge permanently welded to a tough alloy steel body, can be tensioned from 200% to 300% more taut than ordinary blades. This provides a most rigid cutting edge.

Write for the MARVEL Catalog and the complete story on MARVEL METAL CUTTING SAWS

PS-1200

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

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increasing. Ford Motor Company, for instance, has a new assembly line where 41 men do the work formerly done by 117 men.

Not many years ago it was a simple problem to forecast the trend in maintenance, since, in those days changes in maintenance procedures and organization were kept at a minimum and very little variation took place from year to year.

Management during those years felt that maintenance was a necessary evil and the plant engineer had to skimp along—small budget allowances making it necessary on occasion to keep the production equipment operating with sheet metal, baling wire, and low grade mechanics.

Today the plant engineers are gaining recognition and prestige in their own plants and industry as a whole. And as this is happening, engineers of increasing technical and managerial competence are coming to the top.

The qualified plant engineer today must be a thoroughly rounded operating executive. In addition to his technical competence as an engineer he is (and must be) a good organizer, a good manager of men, and a top planner. He must also be good at selling his ideas to other departments or divisional executives as well as the top echelons of his company.

From a paper presented at a special conference of the Manufacturing Div., American Management Association, 1515 Broadway, New York 36, N. Y.

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

MOORE SPECIAL TOOL COMPANY, INC.
732 Union Avenue, Bridgeport 7, Connecticut

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

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High-Strength Weldments for Aircraft

By B. R. Alsobrook
Rohr Aircraft Corp.
Chula Vista, Calif.

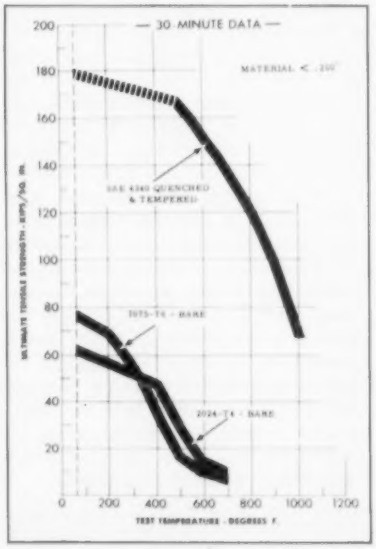
High-strength steel weldments have a definite place in the structures of present and future aircraft and missiles. Rapidly changing environmental factors are imposing more rigid requirements on aircraft and missile structures in relation to complete systems.

Among the changing requirements are increasing thrust, increasing speed and higher operational temperatures. All are interrelated and require, that weight-strength values of structural materials be more critically evaluated in light of their new environments. It is known that structural materials are being exploited to the fullest extent of their capabilities to maintain some compatibility with progress in supersonic flight.

As an example, the relationship of strength versus temperature of a low alloy steel and two aluminum alloys is shown in the accompanying figure. Note that the strength ratio of steel to aluminum is approximately 2.34 to 1 at 300 F—this ratio increases to approximately 4.37 to 1 at 500 F. At this point there is no advantage to be gained by using an aluminum alloy.

One poor feature of the low-alloy steels at temperatures above 600 F is their rapid rate of oxidation. In some missile applications this is only important from the standpoint of storage—operationally this is almost a

Typical tensile properties of sheet metals at elevated temperatures.



negligible factor because of the short times at temperature. We feel that low alloy steels can be successfully used in the lower ranges of temperature where stainless steels are usually used in aircraft, if suitably protected. We are currently conducting studies and experiments on protective surface treatments for low alloy steel weldments to be used in such environment. Once the upper limits of the low alloy steels are exceeded in higher performance aircraft and missiles, the stainless steels and super alloys will be required. Experience and know-how acquired in design and manufacturing techniques on the low alloy, high-strength steels can be applied in large measure to these more exotic alloys.

TO REQUEST COMPLETE PAPERS WRITE TO THE ADDRESS AND ORGANIZATION INDICATED AT THE END OF EACH ABSTRACT

The application of a weldment to a structure almost automatically permits design flexibility that could not be enjoyed had an equivalent forging or casting been chosen. Once a forging has been designed and tooling made, it is costly and delaying if changes are required—not so with a weldment as will be shown later. Structures of the sizes we make by welding every day would place a horrendous load on our heavy machining equipment were we to make them from forgings. We work with smaller parts without fear of machine shop tie-ups. By fitting and holding the finished parts together we come up with a welded structure that is comparable, and often lower in cost, to a machined forging. It is definitely comparable in terms of strength and weight.

Producibility is often expressed as design optimization to permit the manufacturing of a reliable product at the lowest cost. Weldments definitely lend themselves to this category. A design for a welded assembly of several relatively small machined forgings and sheet metal parts is certainly not as awesome as one for a large one-piece structure. A weldment design can be developed with minimum error—errors that are made usually affect only small parts of the whole design and are readily corrected with little delay. Engineering requirements for processing the fabrication are incorporated inflexibly in the design. These controls are well documented and every operator

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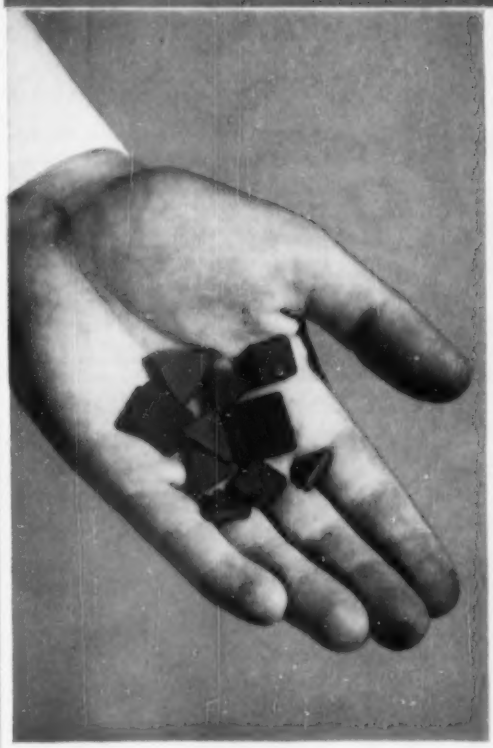

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FASTER SPEEDS, SMOOTHER FINISH, and longer tool life are bonus benefits. That's because Stupalox cutting tools have exceptional wear-resisting properties. They retain their strength at 2000°F and higher. They're resistant to the strongest acids and chemicals normally encountered in machining operations, and nonmagnetic. For complete details, write for Catalog 257.

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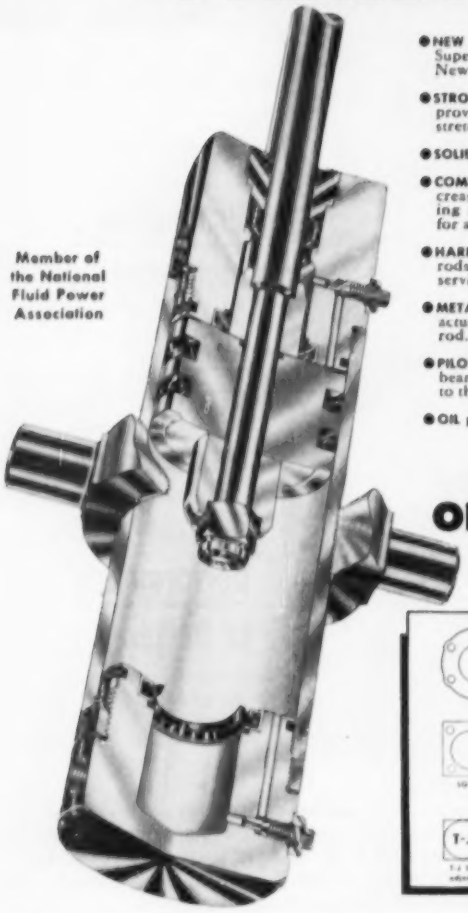

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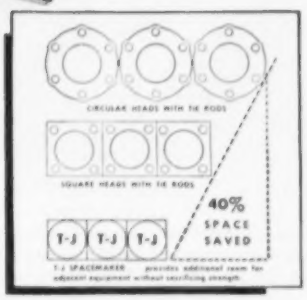

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in production knows that only the welding engineer can authorize on-the-floor changes in procedure. Many of our welding operations are automatic, which insures repeatability of product quality. The trend is now toward automation wherever it can be done. All of these things definitely contribute to expedient delivery of a reliable product at low cost.

From a paper presented at the National Aeronautic Meeting, Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

▼ ▼ ▼

Need for Basic Research

By John T. Rettaliata
President
Illinois Institute of Technology
Chicago, Ill.

We have been living in a period of raw material luxury. Now we face ever-increasing periods of poverty of natural resources. Conservation, substitution, and replacement must be essential ingredients of our future economy.

As reserves go down, the energy required to obtain them goes up. We will have to devise economically practical means of tapping other energy sources, particularly nuclear power. Advances in applications of solar energy will be particularly interesting to watch because of its inexhaustibility.

These are some of the challenging tasks that demand intensified research and development in the years ahead. We must cope with the doubly difficult assignment of achieving a greatly augmented economy at the same time that the resources required for such an economy are diminishing.

In order to accomplish this, it will be necessary to bring into play forces which do not now exist. These will be in the form of further advances in technology brought about by new developments and the useful application of knowledge yet undiscovered.

This means that in the future it will be imperative that greater emphasis be placed upon research, particularly fundamental research. Only in this way will we be able to furnish the essentials for further progress.

About 90 percent of all the research being performed is of the applied type. This kind of research has obviously benefited the nation, but at the same time it has jeopardized the nation's potential for further achievement by depleting our stockpile of existing knowledge. We have been living off of the fat of prior discovery.

Further prosperity demands that our reserves of knowledge be replenished, lest we become unable to supply the components necessary for continued advancement in applied research. Replenishment can be accomplished only through fundamental research. Yet, only 10 percent of our research effort is devoted to this vitally important work.

Fundamental research is the source from which applied research flows. The depletion of reserves in the less tangible area of basic knowledge produces a scarcity just as real as in the field of physical materials.

It is through the coordination of an adequate research program and advanced engineering development that industry stands to realize the most material benefits. That such planning pays off is manifested by the earnings and growth records of some of the country's outstanding companies that adhere to effectual research policies.

From a talk given at the National Industrial Research Conference, sponsored by Armour Research Foundation, Chicago, Ill.

▼ ▼ ▼

Engineers in Manufacturing

By Robert N. Critchfield
Vice President
General Motors Technical Center
Detroit, Mich.

Industrial processes have developed to the point where they require as many technically trained men as product engineering. The engineer is assuming an increasingly important place in the over-all manufacturing picture. One phase of engineering—industrial research—is directed toward developing the best production methods for new products, improving quality of products already in production, eliminating undesirable or unsafe working conditions and reducing product costs. Another phase involves materials conservation, development of quality control gaging devices and techniques, and mechanical assembly and handling methods.

The economics of any new manufacturing arrangement must be thoroughly evaluated by engineers. This evaluation includes labor costs, equipment and tooling expenditures, floor space requirements, work-in-process inventory costs, effect on skilled maintenance costs, effect on quality and required capacities.

From a paper at a meeting of the American Society for Engineering Education, Willard Straight Hall, Cornell University, Ithaca, N. Y.

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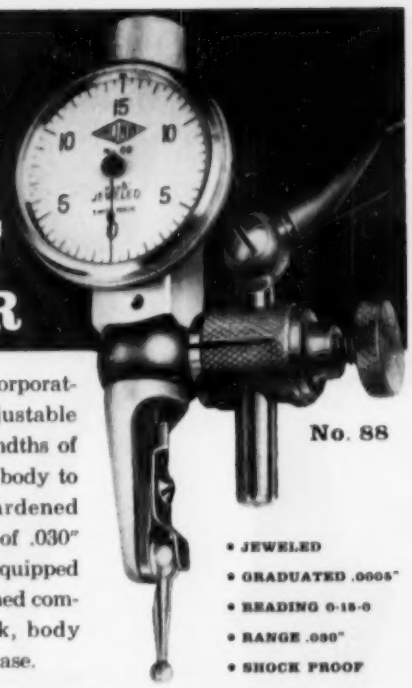

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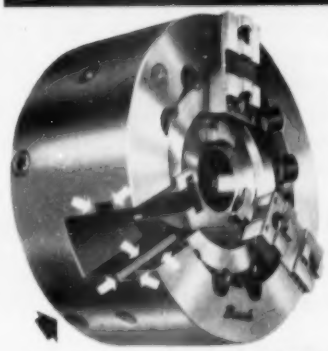

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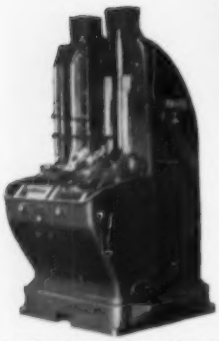

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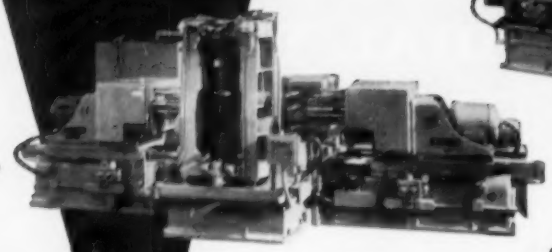

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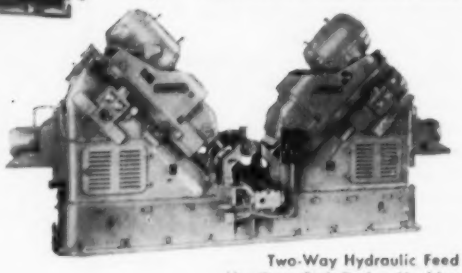

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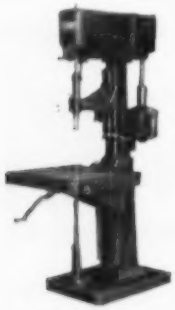

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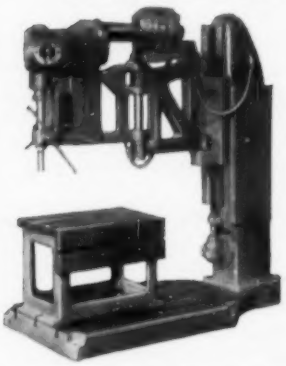

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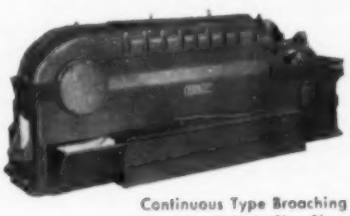

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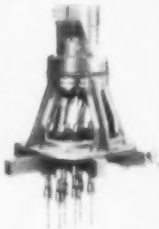

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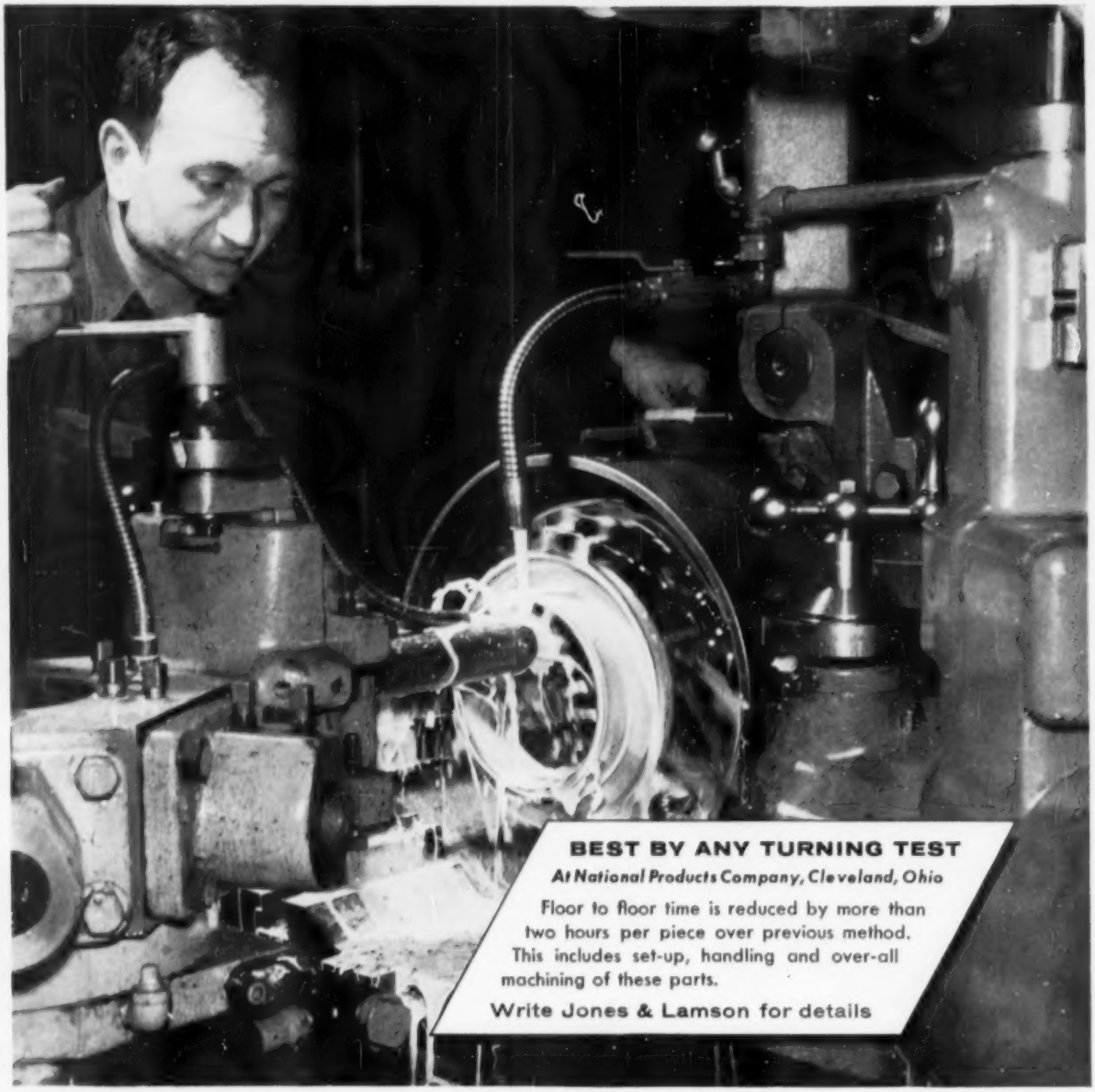
CUSHMAN the CHUCKMAN
CHUCKS AND ACCESSORIES Exclusively SINCE 1882

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials

SOLD THROUGH YOUR INDUSTRIAL DISTRIBUTOR

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

AC617A


BEST BY ANY TURNING TEST
At National Products Company, Cleveland, Ohio
Floor to floor time is reduced by more than two hours per piece over previous method. This includes set-up, handling and over-all machining of these parts.
Write Jones & Lamson for details

Jones & Lamson turret lathes are built and powered to produce *MORE CHIPS per tool*
MORE PIECES per hour
MORE PROFIT per job
than any other turret lathe of comparable size!

JONES & LAMSON

the man who needs a new machine tool is already paying for it

J&L MACHINE TOOL DIV.

JONES & LAMSON MACHINE COMPANY, 518 Clinton St., Springfield, Vt., U.S.A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-204

XLO EX-CELL-O FOR PRECISION

CHIP-BREAKER ASSEMBLY: On the opposite end, mounted under the reciprocating chip-breaker wheel is the chip-breaker table with vertical adjustments. It accommodates adjustable tool block fixture which holds tool in place while grinding chip-breaker groove at desired angle.

TWO MODELS AVAILABLE: Style 142 for conventional grinding with vitrified or diamond wheels; Style 264, equipped with metal-bonded diamond wheels, for *electrolytic* grinding.

new

DUAL PURPOSE RECIPROCATING TOOL GRINDER

Ex-Cell-O takes all the work out of both conventional and chip-breaker tool grinding

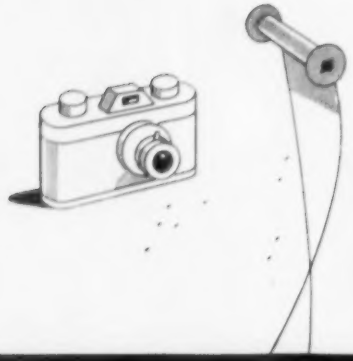
Now an entirely new reciprocating double end tool grinder designed by Ex-Cell-O to do two jobs in one—conventional grinding on one end, chip-breaker grinding on the other—has now been added to Ex-Cell-O's line of conventional, double end, carbide and Method X tool grinders. The difference is the adjustable, power-controlled reciprocation of grinding wheels. The operator need only hold the tool at the pre-set angle.

Other features of this new grinder include: variable stroke (0 to 1½"); variable number of reciprocations (0 to 220 strokes per min.); in-built motorized precision grinding spindle, saddle-mounted to reciprocate along hardened and ground bars which are mounted on pre-loaded ball bushings. You'll want to see for yourself the capabilities of this new Ex-Cell-O—to do so, simply contact your local Ex-Cell-O Representative. Or, if you wish, write direct to Ex-Cell-O, Detroit. Ask for Bulletin 461872.

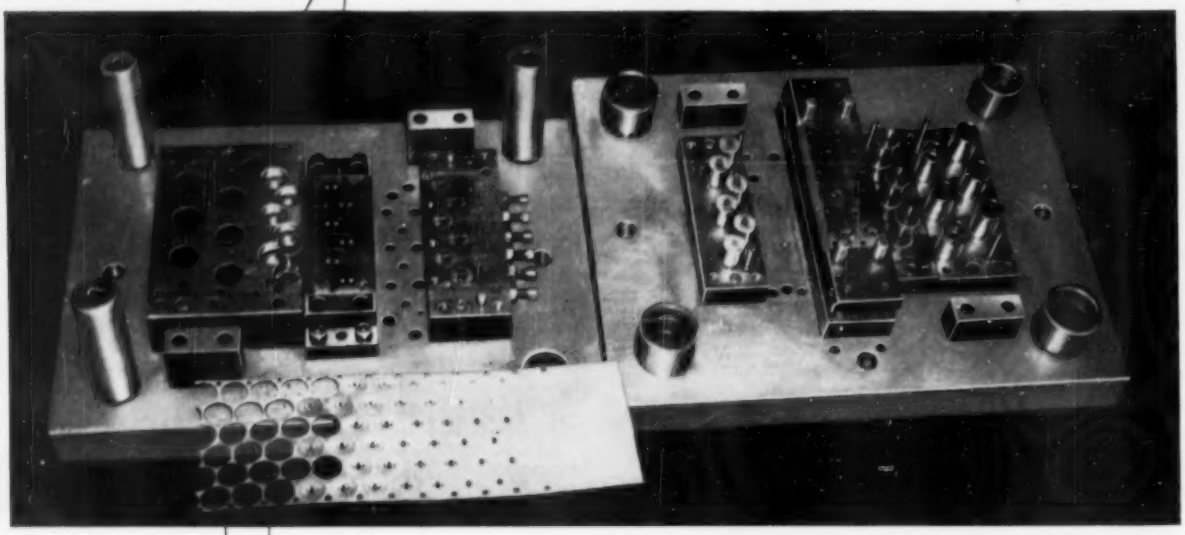
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-25



Over 150 Million Stampings from this ONTARIO Die



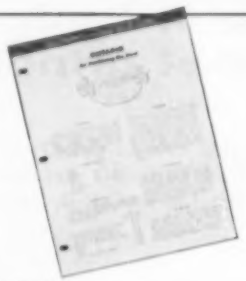
600,000 Film Spool Flanges PIERCED, EMBOSSED, STAMPED and BLANKED per Grind

Production engineers at an eastern camera manufacturing plant have reported excellent results from their Allegheny Ludlum Ontario film-spool-flange die. The Ontario die performs the multiple operations of piercing, embossing, stamping, and blanking.

Operating at 130 strokes a minute, the big die has produced over 150,000,000 parts. Runs as high as 600,000 have been made between grinds. For this operation, Ontario is air cooled from a temperature of 1850 F, then tempered at 350 F for six hours. This results in a Rockwell C hardness of 60-62.

A-L Ontario is an air hardening die steel of the high carbon/high chromium type. It has all the desirable properties of such steels—resistance to abrasion, high hardness and excellent non-deforming characteristics. In addition, it is tougher but easier to machine than the higher carbon/high chromium types which are usually oil hardening.

For the finest in tool steel to help solve your cutting, forming, trimming or blanking problems, call your nearest A-L office or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*



Write for your
ONTARIO BLUE SHEET

A concise 4-page booklet of facts on the handling and shop treatments of Ontario. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

ADDRESS DEPT. TE-96

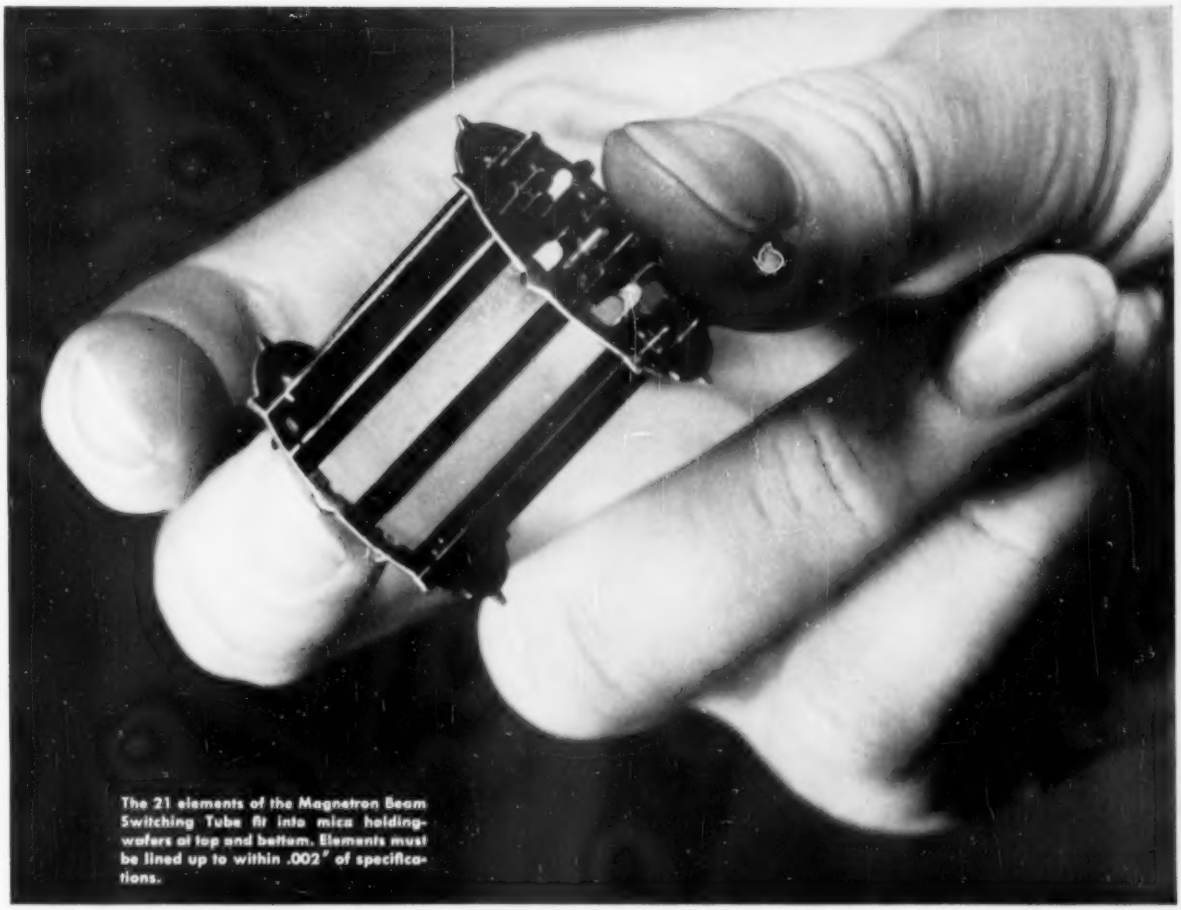
For nearest representative, consult Yellow Section of your telephone book.

For complete **MODERN** Tooling, call

Allegheny Ludlum

WSW 6020

AL ®
FINE TOOL STEELS
SINCE 1854



The 21 elements of the Magnetron Beam Switching Tube fit into mica holding-wafers at top and bottom. Elements must be lined up to within .002″ of specifications.

How costs are cut when inspection speed matches assembly rate

Electronic Tube Division, Burroughs Corporation, faced this problem: Find a way for inspection to keep up with assembly in the mass production of the Magnetron Beam Switching Tube. The answer: Optical gaging with a Kodak Contour Projector.

The assembly of components involves fitting 21 elements (one cathode, 10 targets, and 10 spades) into mica holding-wafers at top and bottom (see photo above). The end product must find all 21 elements lined up to within ± .002″ of specifications. For pressure-type assembly, this is really crowding the limits.

Using a Kodak Contour Projector, Model 8, the inspector is more than able to keep up with top assembly speeds. By comparing the image of the part at 10× magnification with the chart gage on the screen, she can quickly read measurements down to .001″.

Fast, accurate optical gaging of the Magnetron Beam Switching Tube means a substantial saving for Burroughs. Electronic devices of this type are expensive to make. When tube elements are inspected immediately after assembly, imperfect units can be rejected with relatively small expense.

If you have an inspection problem that requires a high-speed, low-cost answer, a Kodak Contour Projector may well fill the bill. Send for the booklet "Projection Gaging with Kodak Contour Projectors." Write to:

Operator working with a Kodak Contour Projector, Model 8, can quickly read measurements down to .001″. Visual inspection easily keeps pace with top assembly speed.

Apparatus and Optical Division

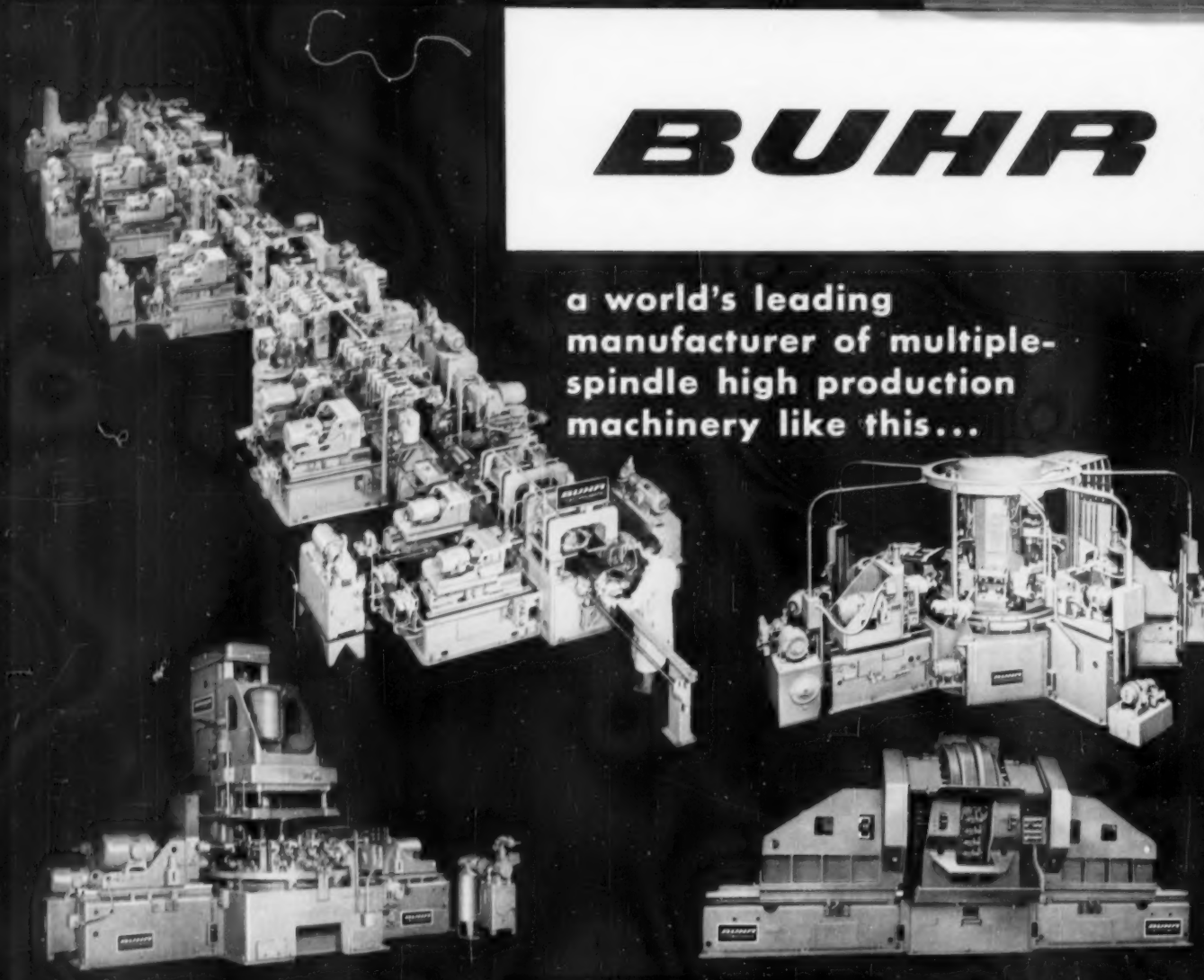
EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADEMARK

BUHR

a world's leading manufacturer of multiple-spindle high production machinery like this...



the record . . .

Since 1912, Buhr has grown steadily to its present position as a world leader in the manufacture of special automation machinery.

Wherever special metal-working machinery is purchased, BUHR ECONOMATICS are well-known for Quality and Performance.

BUHR MACHINE TOOL CO.

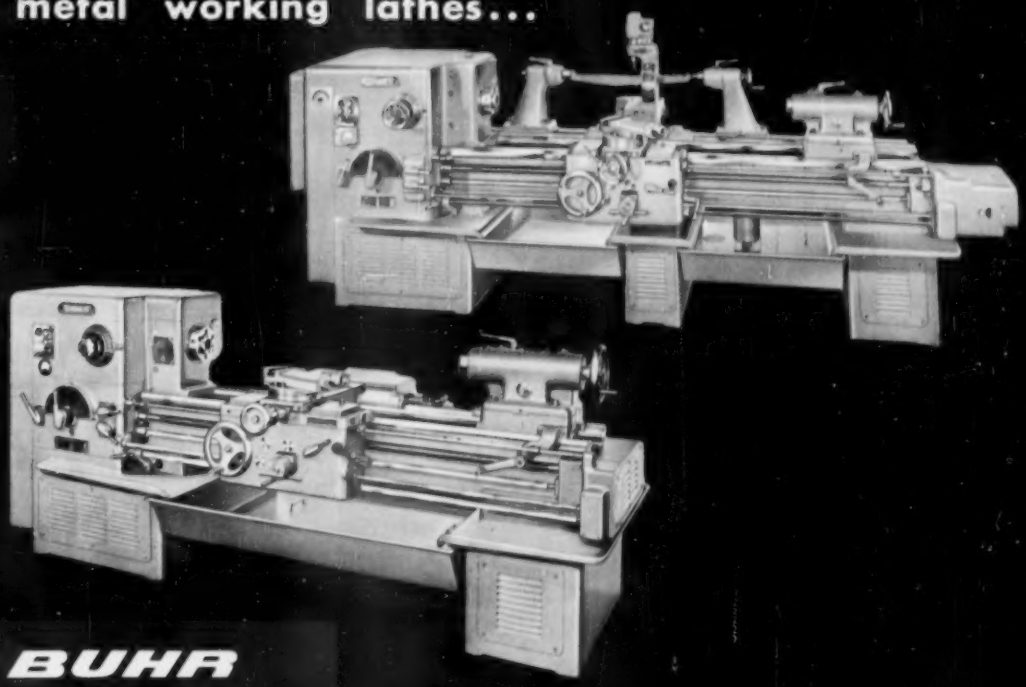
ANN ARBOR, MICHIGAN

Solidly Engineered · Precision Built · for World's Leading Manufacturers

BUHR · ECONOMATIC

ACQUIRES SIDNEY

assumes full control of producing one of the nation's finest lines of precision heavy-duty metal working lathes...



BUHR plans at SIDNEY...

1 **continue the present line** of Sidney engine and precision toolroom lathes, as well as the Sidney Fluid Tracer in the conventional- and universal-type.

2 **expand the Sidney line** to cover a wider range of sizes and applications.

3 **increase manufacturing facilities** to integrate production and assure better delivery.

4 **merchandise Sidney Lathes** with the same aggressiveness which has characterized the selling efforts of the Buhr organization.

SIDNEY... a fine name in lathes... will be even FINER!

SIDNEY

SIDNEY MACHINE TOOL CO.

SIDNEY, OHIO

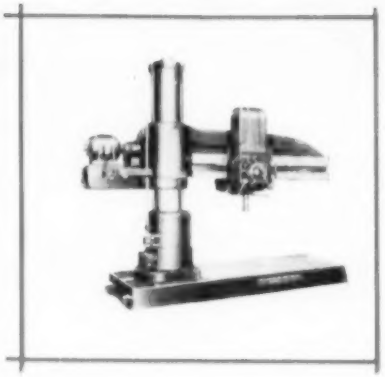
Wholly-Owned Subsidiary of Buhr Machine Tool Co.

Capt. Ormond M. Gove, TWA Jetstream pilot, has logged over 4 million miles.

Specialists do the job better:

In the Air . . . and in the Shop, too

Since 1934, TWA Captain Ormond M. Gove has specialized in safe flight. Since 1916, Carlton has specialized, too. Our specialty: radial drill research, engineering and manufacturing. Our entire energies have been concentrated to produce the most modern radial drills on the market – nothing else. Whatever you require, be it arm lengths from 3-ft. to 12-ft. or column diameters from 9" to 26", count on Carlton. For programming, pre-select, partial pre-select and manual speed-feed controls, count on Carlton. And for added productivity, you can count on special Carlton engineered bases, tables and jigs. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



Carlton

SPECIALISTS IN RADIAL DRILLS

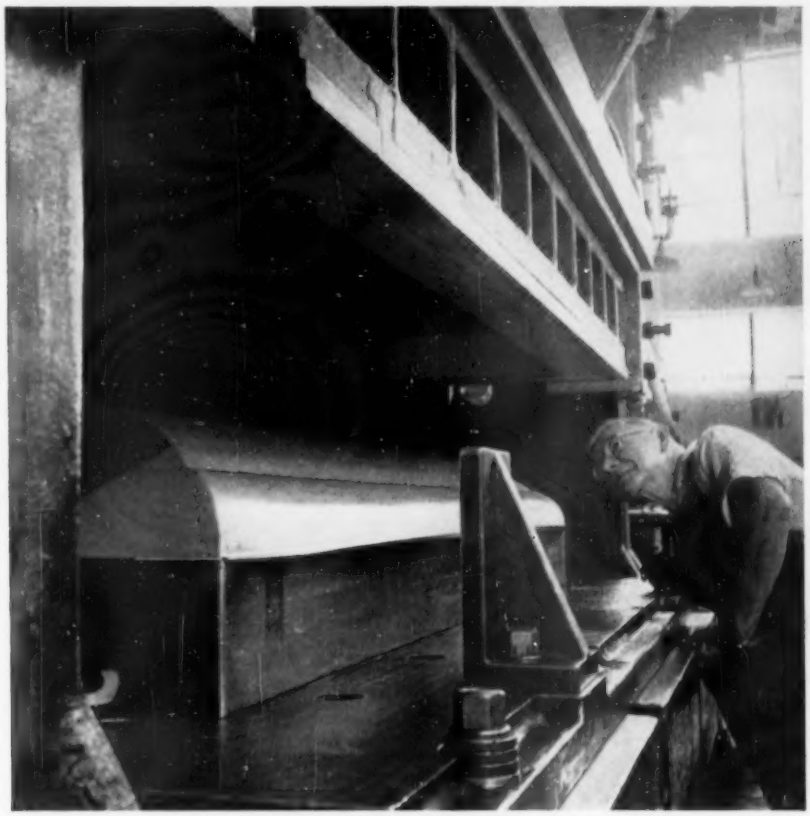
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Forming die made from Brake Die steel machines easily, wears longer, cuts costs

It's obviously no job for an ordinary tool steel. The big die made of Bethlehem Brake Die tool steel comes down with a whoo-o-o-m-p, quickly forming the flange for a casket lid, made from 18-gage sheet steel. The action takes place at Boyertown Burial Casket Co., Boyertown, Pa.

"With the die formerly used," said one of Boyertown's engineers recently, "we obtained only average service because of relatively fast wear. Now that we've changed to Brake Die steel, we get much longer wear, and of course greater economy. The grade stands the gaff, and it machines beautifully."

Bethlehem Brake Die saves time in the shop because it comes in the heat-treated condition, ready for machining without further hardening. It has good wear-resistance, a high degree of toughness, and good resistance to impact. After heat-treatment by oil-quenching and tempering, Brake Die is straightened, stress-relief-annealed, then gag straightened. This is your assurance that it is not only straight, but will stay that way when machined to contour.

Brake Die can be used successfully for a wide variety of bending and forming applications. Your Bethlehem tool steel distributor will be pleased to supply full details. You'll find him very helpful, too.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Preheating Tool Steel? Here Are the Facts

Preheating tool steel before heating to the quenching temperature has long been a confusing subject. Some people advocate that every tool be preheated. Others insist it is not necessary to preheat any tools made of certain grades, supposedly because of the "superior built-in quality" of those steels. The truth lies somewhere between these extremes.

Generally, the need for preheating is based more on the size, shape and condition of each individual tool than on the grade of steel from which it is made.

Under the following conditions, preheating is definitely necessary:

1. Large tools should always be preheated regardless of grade, to avoid any possibility of cracking due to thermal stress. Generally, tools whose cross section is 6 in. or more in one direction, or whose length is more than four times the average section, should be considered "large" for this purpose.

2. Tools with drastic section changes (cross section area ratio of 2 to 1, or greater) should be preheated to avoid warping during heating, which otherwise would produce excessively distorted tools after heat-treatment.

3. Where tools are being heat-treated in equipment which does not provide a protective atmosphere, preheating is advantageous. By using a preheat it is possible to hold the heating time in the furnace to a minimum, avoiding excessive scale and decarburization.

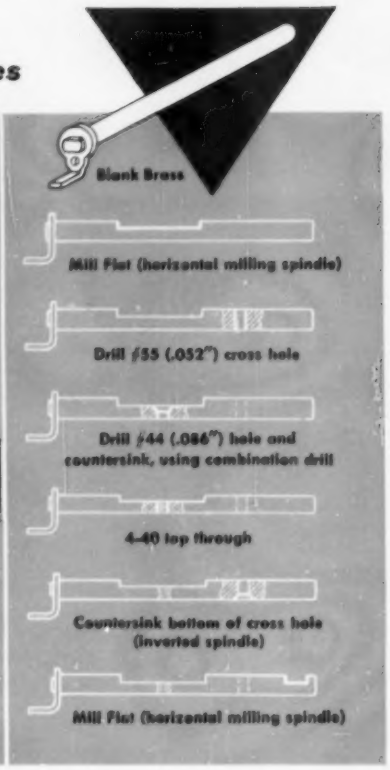
4. If tools have been produced by any method of cold working, such as hobbing, shearing, punching, coining, etc., a preheat is necessary to avoid warping or cracking, unless a stress relief operation was used after the cold-work operation.

In addition to preheating under the conditions listed, many heat-treaters use a preheat as a matter of routine, more or less as a form of insurance. For like insurance, preheating also must be considered before troubles arise.

Where a competitive grade of tool steel is used "because it does not require preheating," you can be sure that the equivalent Bethlehem grade of tool steel can also be used successfully without a preheat on tools of the same size and shape.

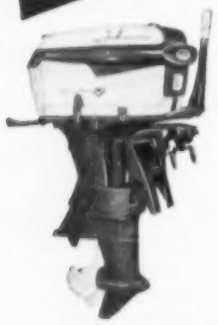
Bodine case history no. 47

Johnson Sea-Horse throttle shaft in 14 varieties


Blank Brass
Mill Flat (horizontal milling spindle)
Drill #55 (.052") cross hole
Drill #44 (.086") hole and countersink, using combination drill
4-40 tap through
Countersink bottom of cross hole (inverted spindle)
Mill Flat (horizontal milling spindle)

THESE ARE SOME OF THE MANY PART VARIATIONS HANDLED ON BASIC SET-UP

unique BODINE combination tooling like this is part of the "Sea-Horse" saga

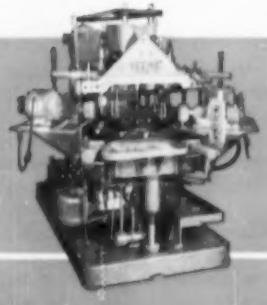


For years Bodine machines and methods have been helping Johnson produce intricate outboard motor parts to high precision standards . . . and within equally close cost limits.

This unusual combination tooling for drilling, tapping and horizontal milling operations is the latest example. No less than 14 variations of these brass throttle, choke and shift parts can be produced on this one machine with fast and simple change-over.

Note the tough holding problem, with holes and flats to be accurately located relative to a crank arm. Note, too, how Bodine swiveling milling heads permit required changes in both width and location of slots. Ready accessibility of tools, indexing table, etc., is obvious. The figures below complete this interesting story . . . and the chances are that Bodine can work out an equally practical and efficient approach to YOUR problem. For further information, write Dept. TE-12.

production data: 550 pieces per 50 min./hr., operating at 11 strokes per minute with manual load and unload.

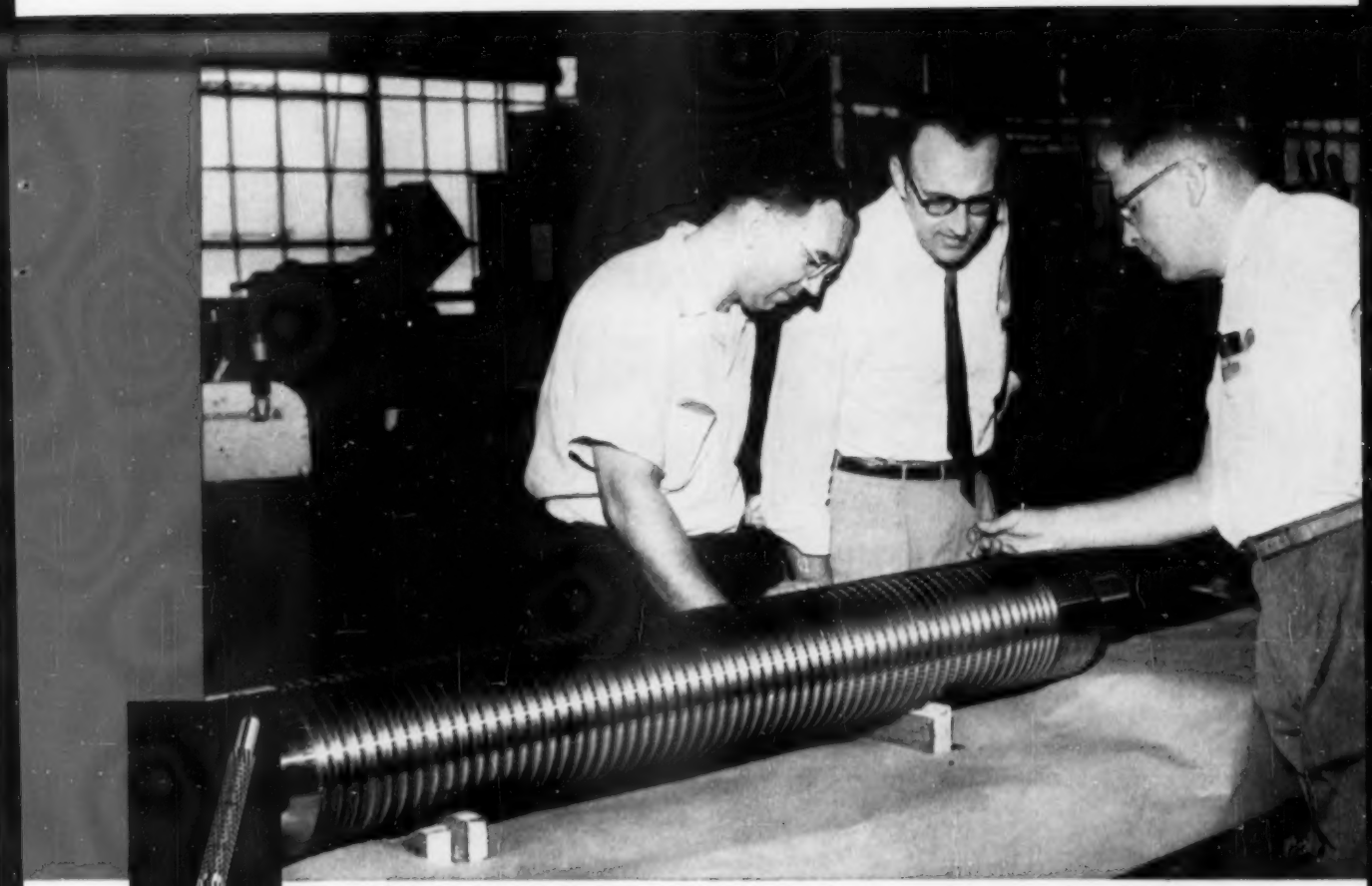


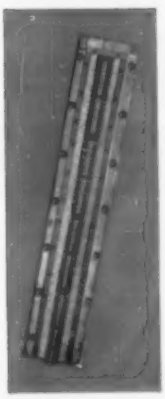
This tooling uses the basic Bodine 42-30 Machine with standardized spindles and horizontal milling attachments. Note how compact this production unit is, requiring only 7' x 8' of floor space.

5805T

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES





The unusually large broach produced for a heavy equipment builder is given careful final inspection by Continental Tool engineers before shipment.

Ever seen a broach this big before?

HERE'S HOW IT WAS MADE—AND WHY

It takes a large tool to broach accurate involute splines in an 8.040" diameter by 4.750" long hole in one pass in a steel part.

Yet that's exactly what the mammoth broach shown above is doing today for a major producer of heavy earth-moving equipment. Its size alone — 8"-plus diameter by 74" length—makes it one of the largest of its kind ever produced by Ex-Cell-O's Continental Tool Works. To make it, required a series of critical manufacturing operations highlighted by the hardening process applied to the shell main body.

One more example of how Continental engineers, plant personnel and facilities team to deliver broaches tailored to meet manufacturers' requirements. Perhaps you have a specific problem you'd like to discuss with them. Simply call your local Ex-Cell-O representative—the service costs you nothing, of course.

Continental

CTW

TOOL WORKS

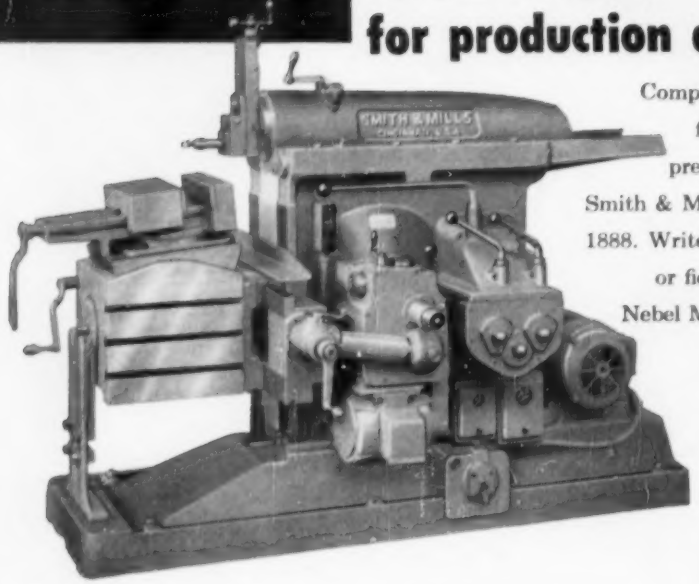
DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

57-69

SHAPERS

Smith & Mills for production and tool room



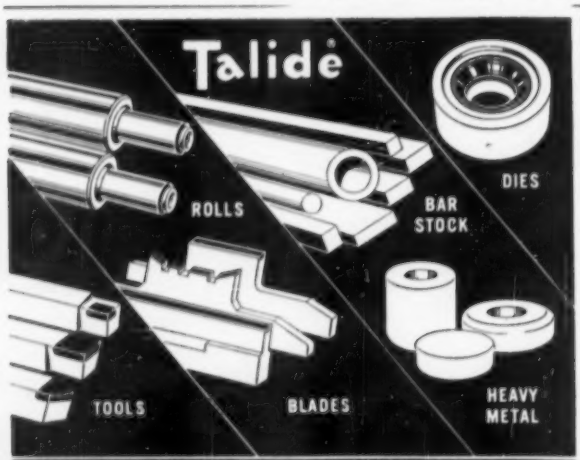
Ram, bull gear, rocker arm and universal table trunnion made of nodular iron for extra rigidity.

Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3411 Central Parkway, Cincinnati 25, Ohio.

Smith & Mills Shapers now available in Heavy Duty Models in 16″, 20″, 25″, 28″, 32″ and 36″ strokes, and Standard Duty Models in 20″ and 24″ strokes.

Smith AND Mills SHAPERS CINCINNATI

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-214-1



HARDEST MAN-MADE METAL!

● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
MC TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

USE READER SERVICE CARD; INDICATE A-12-214-2

Controlled Grinding of Tap Flutes and Chamfers

To Cut Your Tapping Costs, GRIND and RE-GRIND YOUR TAPS ACCURATELY!

Use these basic hook angles as a starting point for better tapping.

Aluminum	18°	Cast Iron	5°	Brass	5°
Copper	18°	Magnesium	18°	Plastics	8°
Mild Steel	8°	Stainless Steel	12°		

Write for specific details on how the BLAKE Flute and Chamfer Grinders give you the accuracy you need for low tapping costs.

EDWARD BLAKE COMPANY INC.
456 CHERRY ST., WEST NEWTON 65, MASS.

USE READER SERVICE CARD; INDICATE A-12-214-3

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303D North 11th St. • St. Louis 6, Mo.

USE READER SERVICE CARD; INDICATE A-12-214-4

now, in air tools, too,

if it's Remington, it's right!

Model PS-A-307L Air Sander. *10¹¹⁄₁₆" long, 3 ⁵⁄₁₆" angle head height, spindle thread ⅝"-11; 5½ lbs. Lever throttle. Includes 7" rubber backing pad, dead handle and wrenches. Also available with button throttle (PS-A-307B)* **$129.50***

huskiest sander in its class— a powerful performer!

PS-A-307L Air Sander being used to prepare metal for painting.

Here is the perfect angle air sander for both light and medium metal removal jobs. With its power and its speed—5900 rpm.—it can do the "in-between" jobs as well as a heavy duty sander...and you don't pay for power you don't use! Though light in weight, it is the huskiest sander in its class! And its light weight—only 5½ pounds—helps reduce fatigue.

Designed for close quarter work, the Model PS-A-307 air sander is only 3 ⁹⁄₁₆ inches from pad to top. It can be used to grind sheet metal and light plate welds, to remove die "dings", to prepare metal prior to enameling or painting and for other metal jobs. It is built with all the quality and precision that have made Remington—manufacturer of sporting firearms and ammunition—famous for 141 years. For full information on the complete Remington line of Mall air tools, just send the coupon.

These great features make this air sander right for you!

- **Short angle head for close quarter work!**
- **5900 rpm. for faster metal removal!**
- **Light weight—only 5½ lbs.!**
- **Built-in automatic oiler!**
- **Automatic speed regulator!**
- **Heavy duty angle bevel gears!**

Impact wrenches—electric and air.

Multi-purpose flexible shaft grinders.

Midget collet die grinders. Variety of sizes.

**Prices and specifications subject to change without notice.*

Remington

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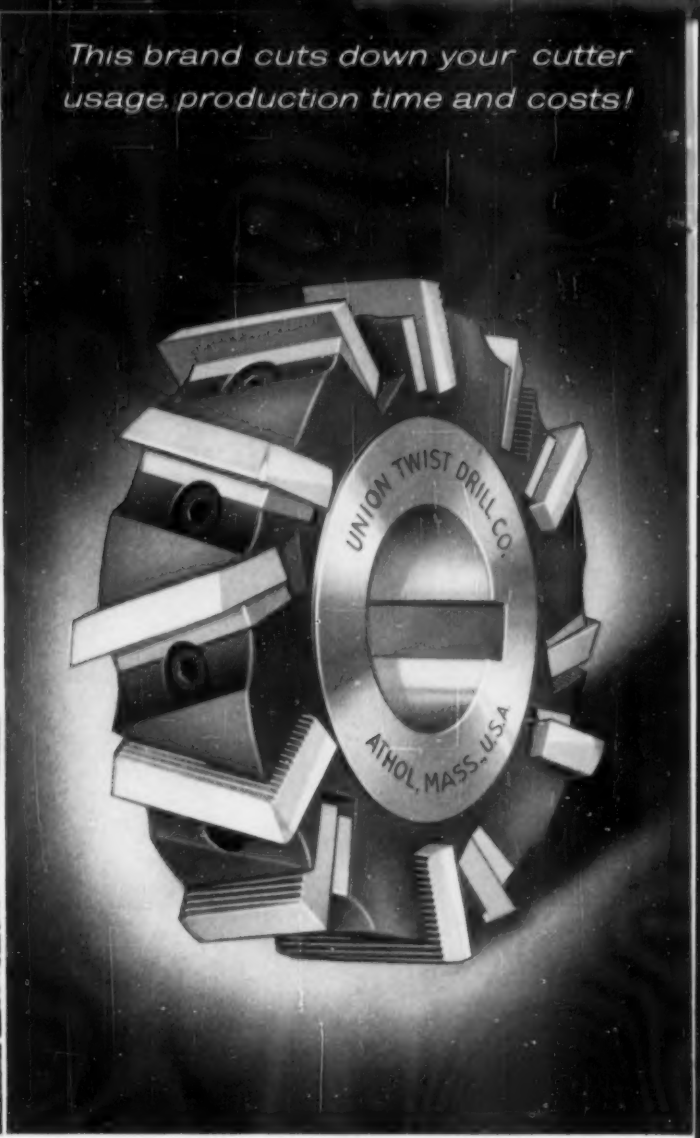


The more you use inserted tooth cutters — high speed steel or carbide — the more you need Union

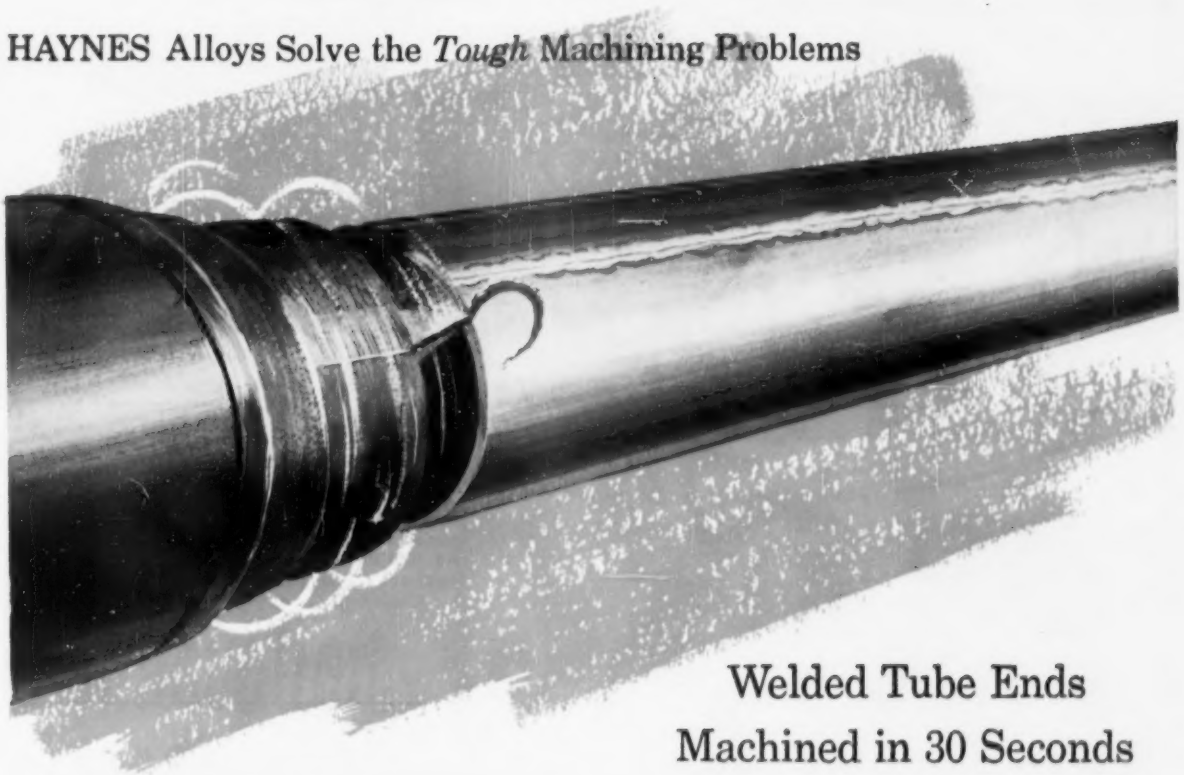
Union manufactures milling cutters, gear cutters, drills, end mills, reamers, hobs and carbide tools. Available nationally through Union Distributors and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco. S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vermont.

UNION

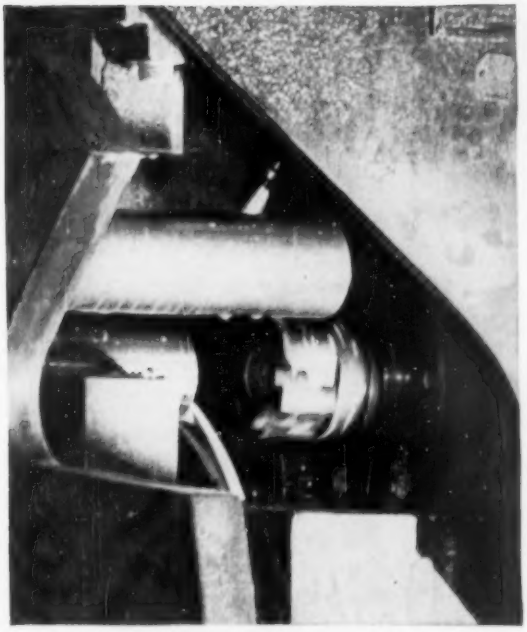
TWIST DRILL COMPANY, Athol, Massachusetts

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money.

HAYNES Alloys Solve the *Tough* Machining Problems



Welded Tube Ends Machined in 30 Seconds



No down-time or interference with production while making an interrupted cut on thin welded tubing. 37 tubes are machined per hour in automatic set-up.

HAYNES STELLITE alloy tools are standard equipment on an automatic set-up for machining the ends of very thin, welded tubing. The tools are tough enough to operate for long periods of time under difficult machining conditions.

The tube ends are thin and tend to vibrate . . . the welded seam creates an interrupted cut on every revolution . . . and the cutting tool edge must remain sharp to make a clean cut without damaging the tube ends. Other tools tried on this application either mushroomed the tube ends, or failed by chipping. Only HAYNES STELLITE tools have handled the operation successfully in an automatic set-up.

For complete information on the unusual characteristics of HAYNES STELLITE Metal-Cutting tools, ask for our 16-page booklet. Write Haynes Stellite Company, Kokomo, Indiana.

HAYNES ALLOYS

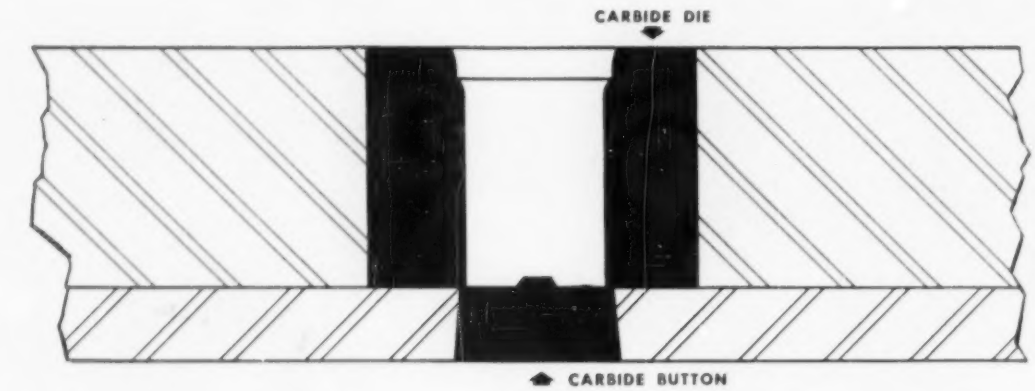
HAYNES STELLITE COMPANY

Division of Union Carbide Corporation

Kokomo, Indiana

UNION CARBIDE

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide Corporation.



Cross section of Carboloy carbide-equipped die used by Federal Drop Forge Co. The die cold-extrudes SAE 1010 steel blank (A) into ball seat (B) for automotive steering mechanism.

Cold-extruding 1010 steel ball seats . . .

AN EXTRA DAY'S OUTPUT EVERY 3 DAYS WHEN CARBOLOY® DIES REPLACED STEEL

Carboloy cemented carbides are harder than steel — and far more resistant to wear. That's why carbide-equipped cold-extrusion dies save an average of 2½ hours of press downtime *per shift* at Federal Drop Forge Co., Lansing, Michigan.

When steel dies were used, they were polished each shift . . . and the button (see diagram) had to be reground. Time lost: 2½ hours per shift, or the equivalent of one working day every three days. Steel die life averaged 25,000 pieces; steel buttons produced about 15,000 pieces per grind.

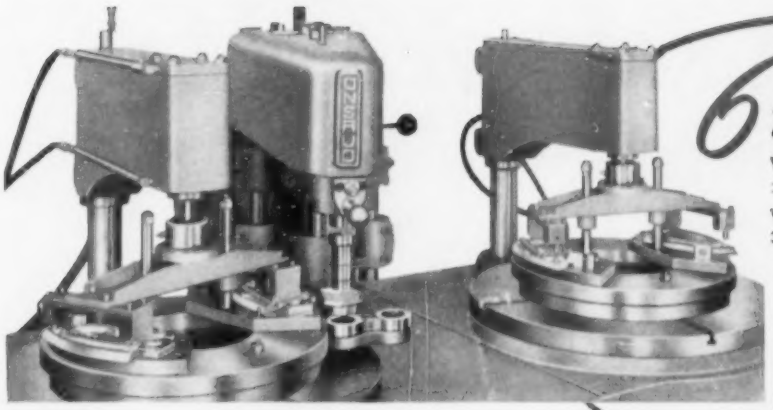
Now that Carboloy carbide dies and buttons are used, only occasional polishing is required. One die has produced almost 1 million extrusions in 2½ years with only .0003" wear . . . and carbide button life averages 2 million pieces.

In addition to longer die life, a costly centerless grinding operation was eliminated because, with carbide dies, specified tolerances are held from beginning to end of the run. And, the surface finish after extrusion is better than previous centerless-ground finish.

The unique properties of Carboloy cemented carbides can be used just as effectively on drawing, forming, or blanking operations. Check with your diemaker for more information. Or write: *Metallurgical Products Department of General Electric Company, 11101 E. 8 Mile Street, Detroit 32, Mich.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC



6 TIMES FASTER PRODUCTION!

WITH **GREATER ACCURACY:**
±0.0025" TOLERANCE

WITH **FINER FINISH:**
30 MICRO-INCHES

OPERATION and PART:
production contour profile milling of aluminum hand iron sole plates

THE "Innovation" OF MACH-MIL

NONFERROUS MILLING PRODUCTION

Onsrud Mach-Mils require only normal tooling and low cost fixtures . . . yet increase nonferrous milling production from four to ten times, depending upon the type of part.

In the A-28 Contour Milling Mach-Mil shown here, a 10,000 RPM milling head is combined with dual-table rotary feeds for production contour milling at very low cost. The arm mounted milling head pivots automatically between tables, milling work on one rotating table while the other table is unloaded and loaded. A follower template on each table controls cutter travel through the milling cut. The A-28 is designed for parts up to 28" diameter. Work set-ups may be for single or multiple stations, depending on part dimensions. Because of rotary table feed, parts requiring milling on four sides or quadrants may be milled in one time-saving operation.

Your inquiry is invited for complete information.

ONSRUD A-28 CONTOUR MILLING **MACH-MIL**

Dual table contour milling Mach-Mils are built with 28" and 18" work capacities and in choice of spindle speeds. Onsrud Mach-Mils are also offered in a wide range of types and capacities for face, straight-line and contour milling . . . with rotary feeds up to 50" maximum work capacity . . . and in standard reciprocating table feeds in work capacities to your specifications. Special machines are also supplied with indexed stations for automatic drilling and tapping in combination with milling feeds.

WRITE FOR CATALOG NO. 1162 . . . twenty-four pages featuring Onsrud Mach-Mils for nonferrous production milling.

ONSRUD
MACHINE WORKS, INC.
MACHINE TOOL DIVISION
7726 Lehigh Avenue • Niles 31, Illinois
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Onsrud

For doing things *better* by doing things *differently!*

The makers of the INCHWORM®, that fantastic mechanism that can precision feed tools in the microinch range, faced what at first appeared to be an insurmountable problem: How to develop 2500 psi oil pressure and maintain it precisely for controlled time periods.

Airborne Instruments Laboratories, Mineola, L. I., makers of the INCHWORM, called in a Bellows Field Engineer. "What can we do with 'controlled-air-power'?" they asked.

Airborne and Hydrair Corp. (Bellows engineering division) jointly devised a unique closed-circuit air-hydraulic unit which takes 50 psi air pressure, builds it to 2500 psi oil pressure, and holds it precisely at that point for a predetermined time period. They made the INCHWORM inch—a movement controllable in the range of 0.000,005" to 0.0001".

This application of Bellows "Controlled-Air-Power" is unusual, yes, but no more so than the many special problems Hydrair Corp. engineers are solving every day in fluid power use.

If you have a special control problem involving the use of pneumatic or hydraulic circuits, talk to a Bellows Field Engineer. You'll find it well worth while.

®Airborne Instruments Laboratories

952-B

They're in the book

One or more Bellows Field Engineers are located in every major city or industrial area in the United States and Canada. They are listed in their local phone directories under "The Bellows Co." (In Canada, under Bellows Pneumatic Devices of Canada, Ltd.) Phone him, or write for a copy of our booklet—"The Place of the Bellows Air Motor in Original Equipment Design." Address Dept. TE-1257.

The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

FOUR WAYS TO IMPROVE YOUR GAGING PROGRAM

Starrett HIGH PRECISION LOW FRICTION Dial Indicators

1 CUT MAINTENANCE

With fewer parts and interchangeable gear assemblies in No. 25, No. 655 and No. 656 sizes, Starrett Dial Indicators cut maintenance costs. You keep more indicators in service longer with fewer spare parts to stock. The entire gear assembly can be removed as a unit for convenience in servicing.

2 IMPROVE ACCURACY

Simplified design with rugged, rigid construction means Starrett Dial Indicators are less subject to friction and wear. Replaceable low friction jeweled or inserted bronze bearings align accurately to eliminate end play. Rustproof stainless steel gears and tempered pinions, stainless and tempered racks and spindles and heavier bridge and case, all make for lasting accuracy.

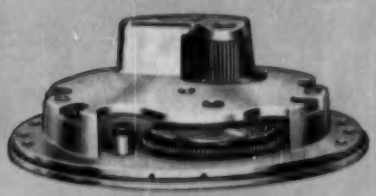
3 INCREASE EFFICIENCY

New easy-reading dials, satin chrome exterior finish and contrasting black bezels help operators read faster and more accurately with less eye fatigue. Count hands on long range models read directly in decimals . . . no calculations.

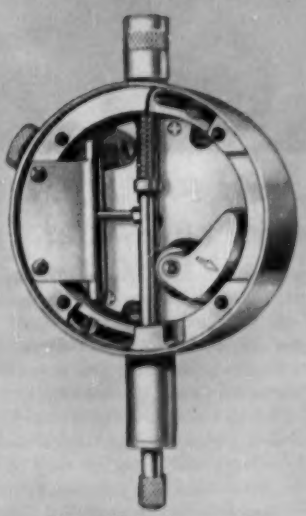
4 IMPROVE PERFORMANCE

Direct acting springs completely around the spindle or rack eliminate cocking and side friction. Action is smoother, more accurate, with less contact pressure. And with the new Nonshock mechanism to stop shock *before* it reaches the gear train, Starrett indicators stand up longer even on brutal gaging applications.

Front view showing easy-reading dial with contrasting black bezel



Interchangeable gear mechanism features simplified unit construction



View with back removed showing inside mechanism

SEND THE COUPON *for catalog describing the complete line of Starrett High Precision-Low Friction Dial Indicators.*

Buy through your INDUSTRIAL DISTRIBUTOR — Prompt delivery · Dependable service · Quality products

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WORLD'S GREATEST TOOLMAKERS

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The L. S. STARRETT COMPANY, Dept. E
Athol, Massachusetts

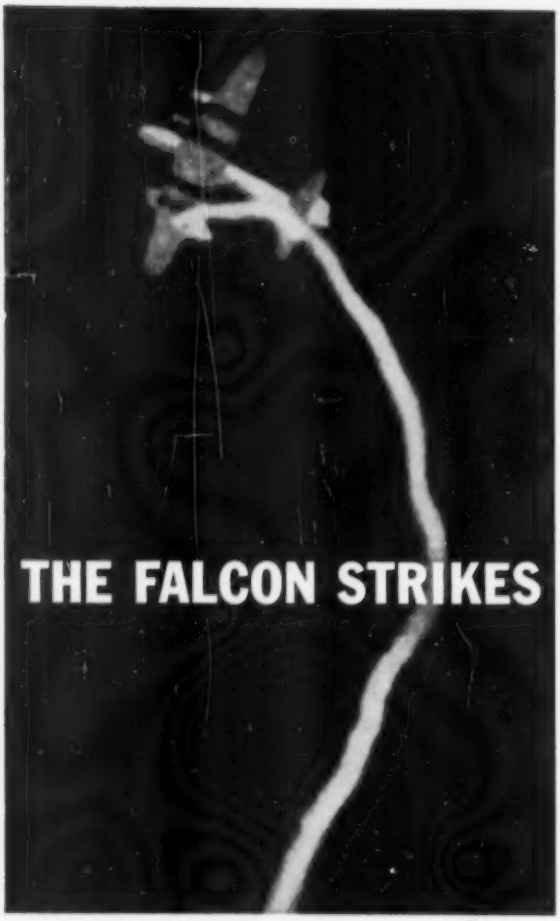
Please send information on Starrett *High Precision-Low Friction* Dial Indicators.

Name..... Title.....

Company.....

Street and Number.....

City.....Zone...State.....



. . . and Bristol Multiple-Spline socket screws are aboard!

The air-to-air Falcon Missile, designed and built by Hughes Aircraft Company, is now fully operational in squadrons of the Air Defense Command.

Naturally, we're proud that Bristol socket screws were selected for this outstanding new defense weapon. Every Falcon component must meet the most rigorous military standards and must stand up under the most severe environments.

Bristol-originated Multiple-Spline socket screws are ideal for critical holding jobs. They are used in hundreds of products: shavers, communications equipment, instruments, vending machines, cameras—as well as guided missiles.

On sale at leading industrial distributors. Ask your distributor about them today. He can give you sound advice on your application problems and fast service from complete stocks.

A-7-7

Precision socket screw manufacturers since 1913

*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diam.

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

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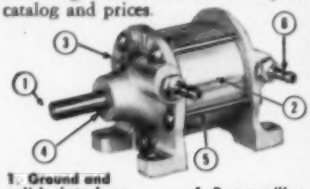
AIR-MITE AIR CYLINDERS

Low Cost . . . Compact . . . Powerful . . . Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel ram
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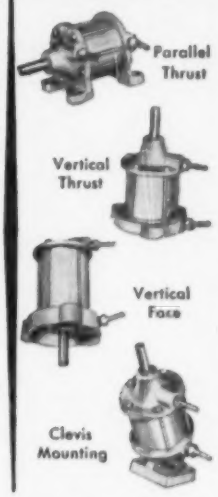
4 Mounting Types



AIR-MITE

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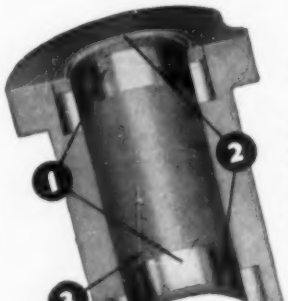
INCREASE PRODUCTION.. SAVE TIME & MONEY



*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 48.

MEYCO

Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

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W. F. MEYERS CO., INC., BEDFORD, INDIANA

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Parts made by almost every industry have holes made by a KINGSBURY

From the carburetor body to the lock cylinder . . . the bearing race to the hammer head . . . would just be a variety of parts — except for one important advantage in common:

the drilling and tapping operations were completed faster, at lower cost per operation, with unvarying accuracy — in every single part — because an automatic Kingsbury machine did them.

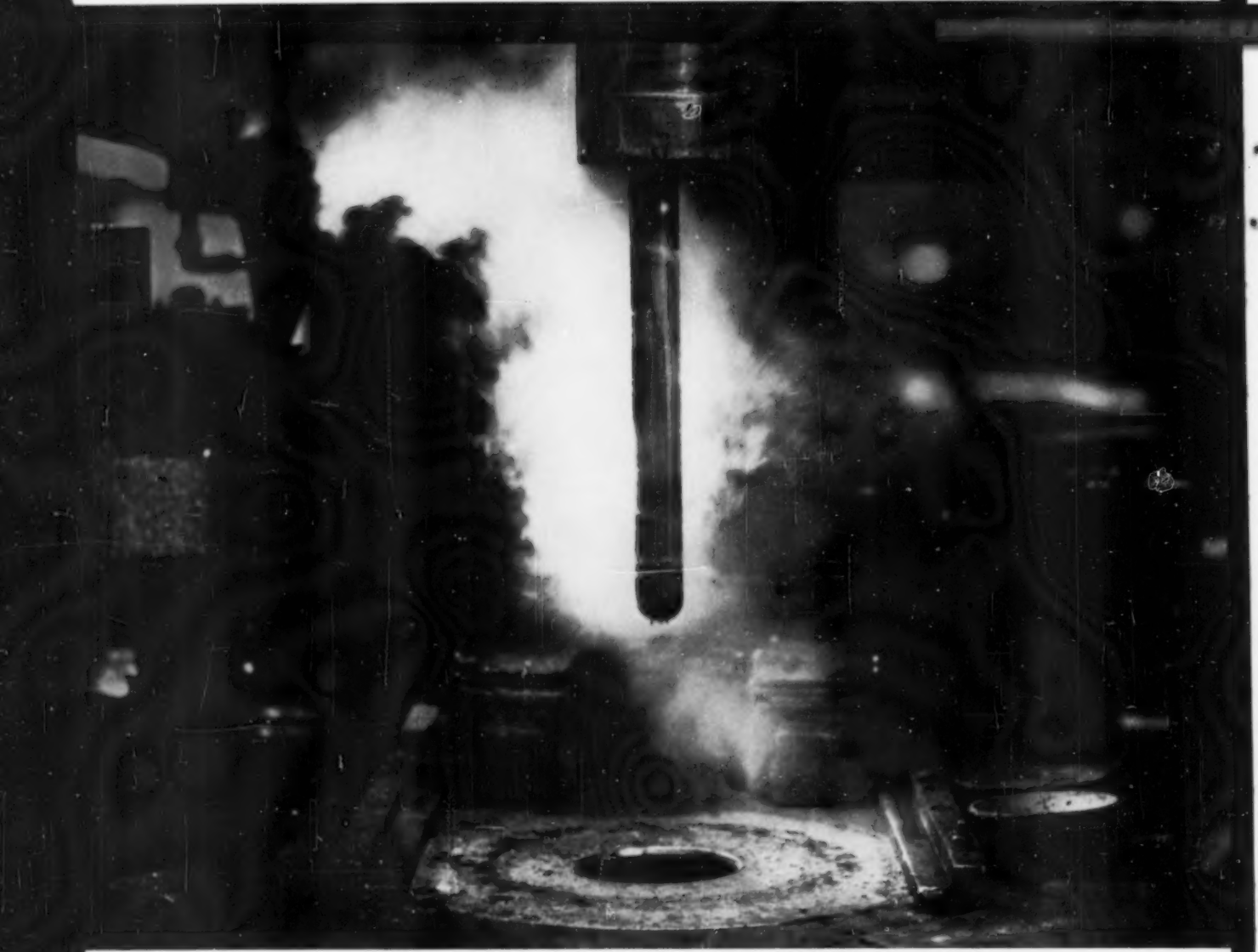
This can mean a distinct manufacturing advantage to *you*, if you have high production drilling, tapping, reaming, spot facing, light milling and similar operations to do on your parts. You can do them at the *rates you need*, at the *lowest practical cost, month in and month out*, on a Kingsbury indexing automatic.

"Kingsbury jobs" — as the automotive and appliance industries frequently call them — are typically done in this manner: The manufacturer sends Kingsbury a print (or sample) of his part, specifying operations and the production rate required. Kingsbury then incorporates the appropriate standard operating units, base, indexing unit and drive, to build an automatic drilling and tapping machine *to do what the customer wants, at the rate he wants.* Test runs by Kingsbury *before* shipment, and *delivery of a fully tooled machine* ready to produce, provide positive assurance that performance will match production requirements.

Whether you make automotive, plumbing, hardware, machine, electrical appliance or some other kind of parts, investigate the production and cost benefits in doing the drilling and tapping on a Kingsbury. Send your requirements and questions to Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY

INDEXING AUTOMATICS
for high production drilling and tapping



Tough 2½" diameter mandrel at Rc 44 on 1150 ton brass extrusion press. Scovill Manufacturing Co.

Mandrel of HALCOMB 218 retains toughness and hardness at hot work temperatures...

This mandrel is made of Halcomb 218—a tough, air-hardening hot work steel. Halcomb 218 is suitable for tools like this which require a higher degree of toughness at moderately elevated temperatures than is obtainable with the tungsten types of hot work steels. And Halcomb 218 *retains both* its hardness and strength at these temperatures.

For example, at a hardness of Rc 44, Halcomb 218's Charpy Impact Strength is 33 ft-lbs at 500F. And it will retain this hardness after 1 hour, after 10 hours and even after 100 hours at temperatures up to 900F.

Properties like these cut tooling costs. The mandrel shown above is good for 1200 pushes, for example, and even then all it needs, usually, is repolishing before being used again.

Halcomb 218 is particularly useful for all hot work operations on which drastic coolants are used. It even resists breaking very successfully when water cooled in operation. If these sound like advantages you can use, call your local Crucible representative for more complete data. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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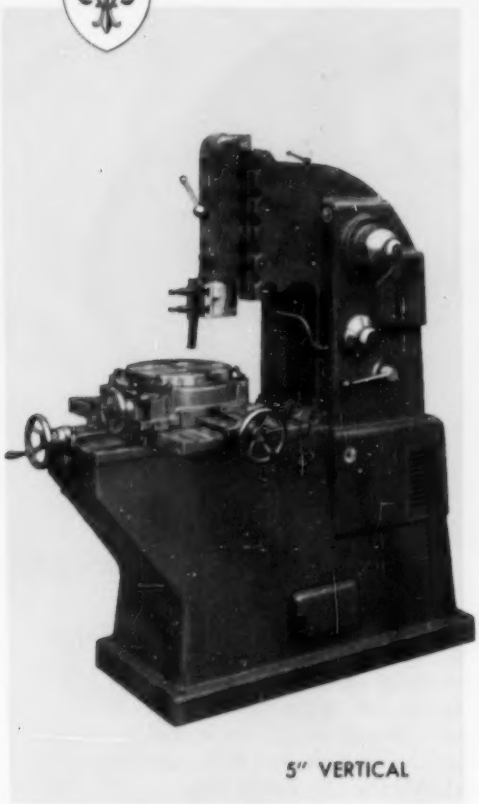
SHAPERS

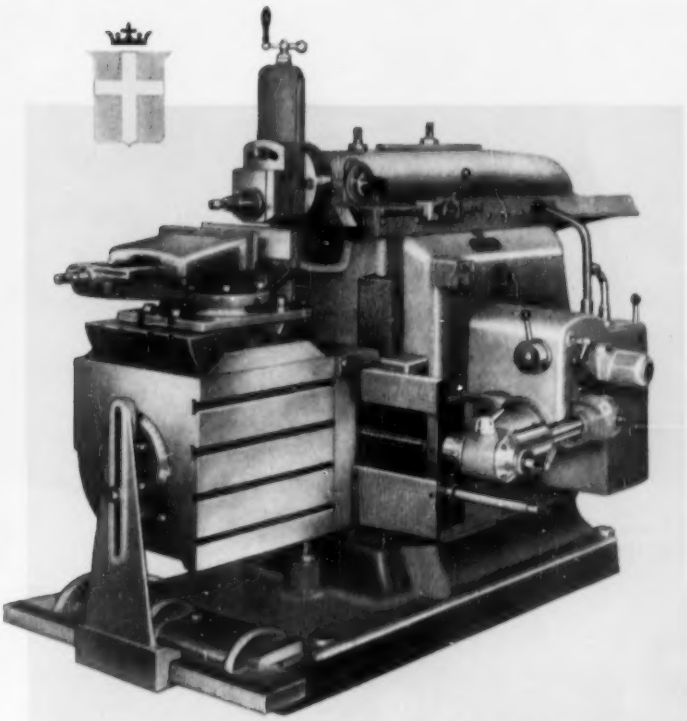
BUILT TO U.S. STANDARDS BY EUROPE'S FINEST CRAFTSMEN

The finest old world skills build life-long precision into these shapers assuring dependable production to the most exacting tolerances. Sound engineering standards and modern design are combined in these shapers offered at low initial cost.



5" VERTICAL

Chomienne Vertical Shaper—
5" stroke, with 12½" rotary table, automatic lubrication, power feed. A real time-saver for accurate machining of irregular shapes and forms. Low initial cost.



ES-26 UNIVERSAL

VMA Shapers—standard and production models . . 14" to 28" stroke . . automatic lubrication, table power rapid traverse.

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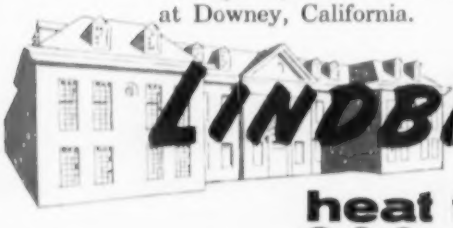
When aluminum needs heat treating it's time to look to LINDBERG

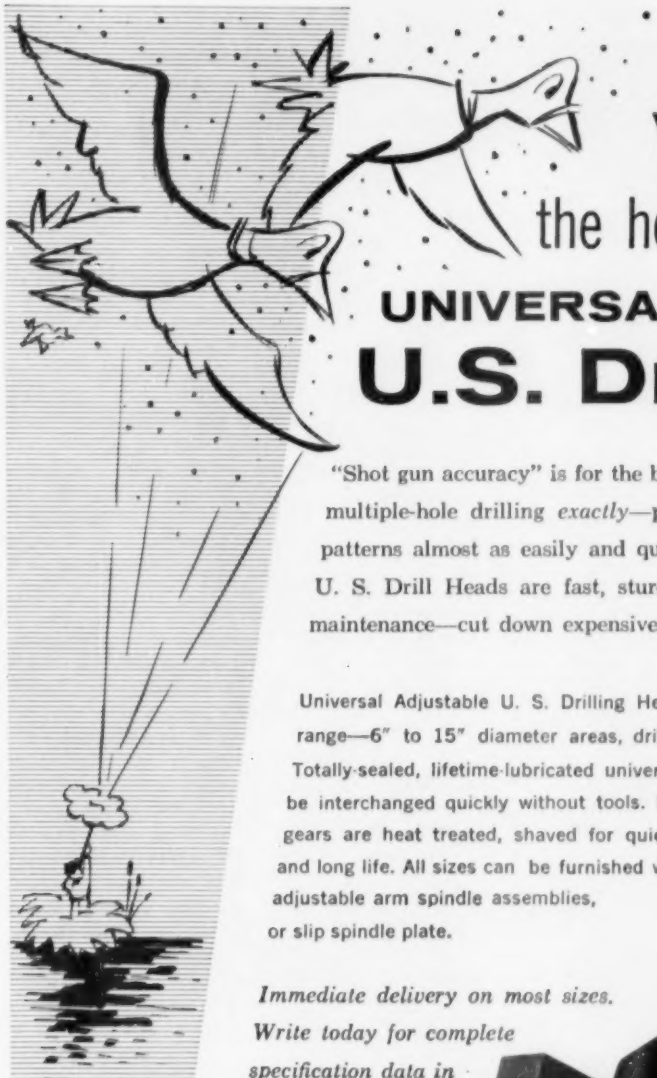
Lindberg Cyclone batch type furnace for heat treating aluminum castings.

When your use of aluminum makes it essential to apply heat for annealing or stress relief Lindberg can come up with the right equipment to do the job. Whatever the requirement our long experience in the application of heat to all types of metal can provide you with just the right furnace to fill your specific need. Maybe the batch type furnace shown here is what you need, or a big bottom quench for treating large aluminum sheets. No matter, Lindberg's staff of engineers, metallurgists and research technicians will face up to your problem. They'll help you find the answer, too, with the right type of equipment to treat aluminum or aluminum alloys to exact requirements of your product. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality. Lindberg Engineering Company, 2447 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.



LINDBERG

heat for industry



You **KNOW** where the holes will be . . . with

UNIVERSAL ADJUSTABLE

U.S. Drill Heads

"Shot gun accuracy" is for the birds. With U. S. Heads you pin-point your multiple-hole drilling *exactly*—position the drilling spindles for different patterns almost as easily and quickly as you read them from your prints. U. S. Drill Heads are fast, sturdy, long-lived and require only minimum maintenance—cut down expensive re-operating cost, too!

Universal Adjustable U. S. Drilling Heads cover a wide range—6" to 15" diameter areas, drill sizes up to 1-1/16" Totally-sealed, lifetime-lubricated universal joints can be interchanged quickly without tools. Stub tooth gears are heat treated, shaved for quiet operation and long life. All sizes can be furnished with adjustable arm spindle assemblies, or slip spindle plate.

Immediate delivery on most sizes. Write today for complete specification data in new catalog No. AD-57.

Style U-1L Universal Adjustable Head provides 9" diameter drilling area.

FOR MEN WHO KNOW DRILL HEADS BEST, IT'S ALWAYS U.S. DRILL HEAD...5 to 1.

US DRILL HEAD

We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.

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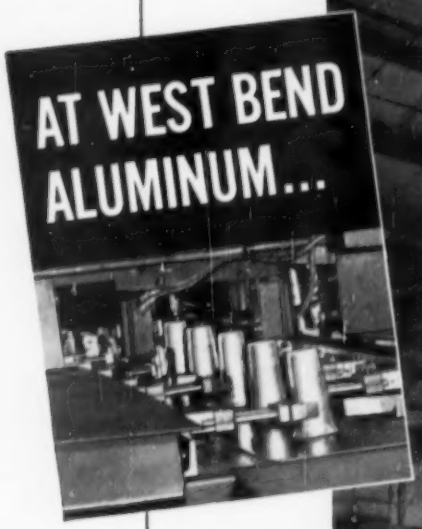

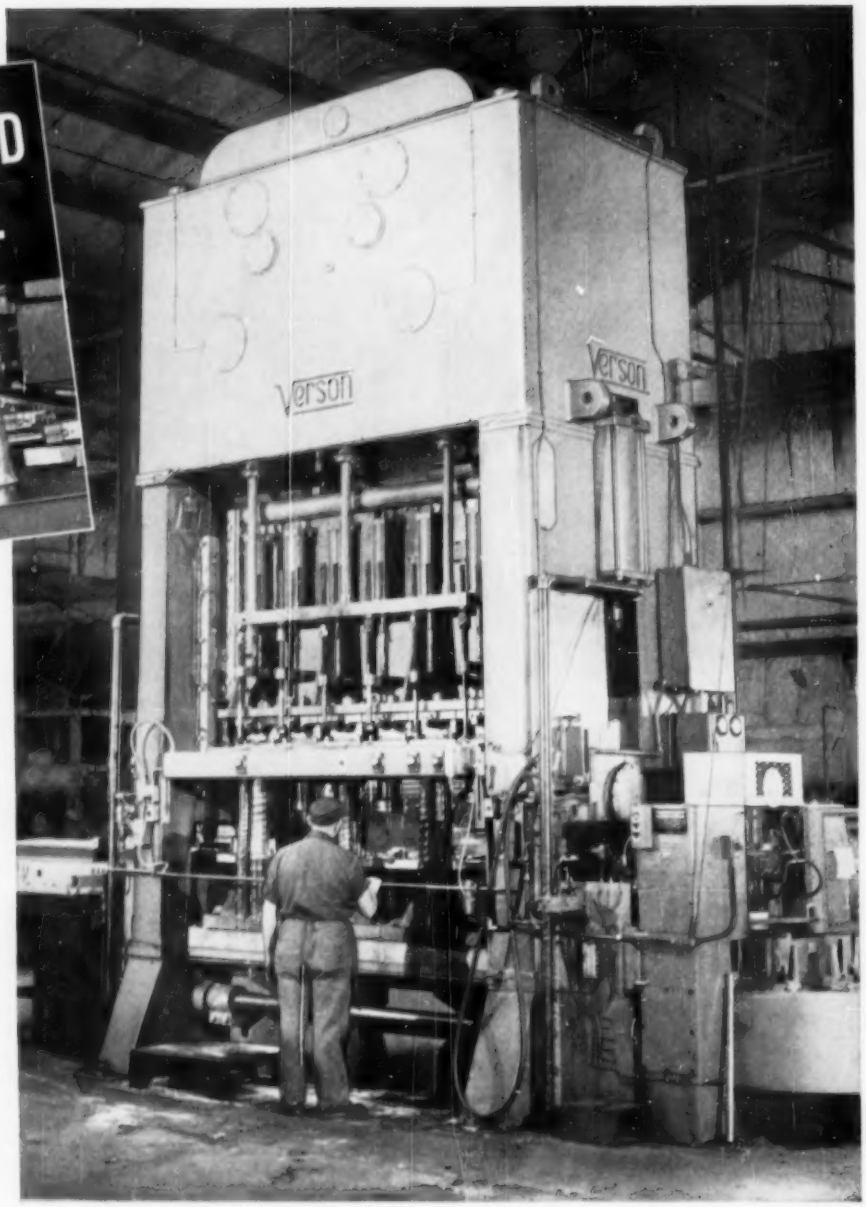

THIS 200 TON

Verson

TRANSMAT PRESS Performs 6 Operations

•

Produces 800 Tumblers Per Hour Automatically

In use at West Bend Aluminum Co., West Bend, Wisconsin, this Verson Transmat Press produces 10 ounce tapered aluminum drinking tumblers at the rate of 800 per hour, automatically.

3003 aluminum alloy blanks, .025 x 8½" diameter, are fed into the press by a blank feeder. The piece is moved by mechanical fingers through the 6 stations of the press.

The 1st, 2nd, 3rd, and 4th stations perform full draws of 30%, 26%, 24%, and 16% reductions. The 5th draw is a 21% reduction, but only 1¼" deep. A forming operation in the 6th station completes the tumbler except for trimming and buffing.

If you must produce 4000 or more identical stampings daily requiring four or more operations, Verson Transmat Presses can definitely lower your production costs. Let us show you how. Send outline of your requirements.

170

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

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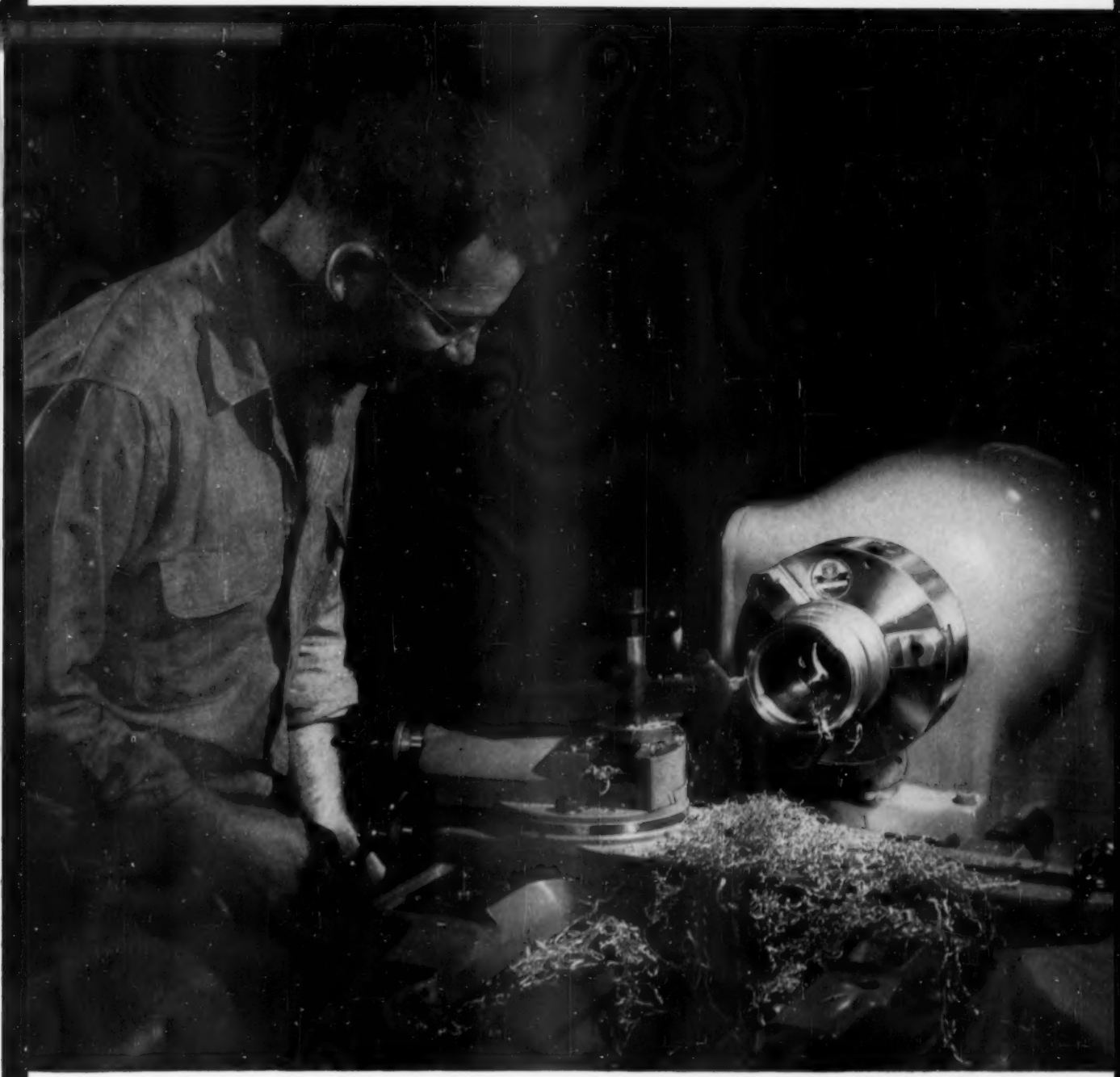

Photo courtesy of the Barber-Colman Company

THE LATHE — *Hendey No. 2E 14" General Purpose Lathe*

THE OPERATION — *Turning and facing an aluminum component*

THE CHUCK — *Horton, of course*

HORTON CHUCK DIVISION
Greenfield Tap and Die Corporation
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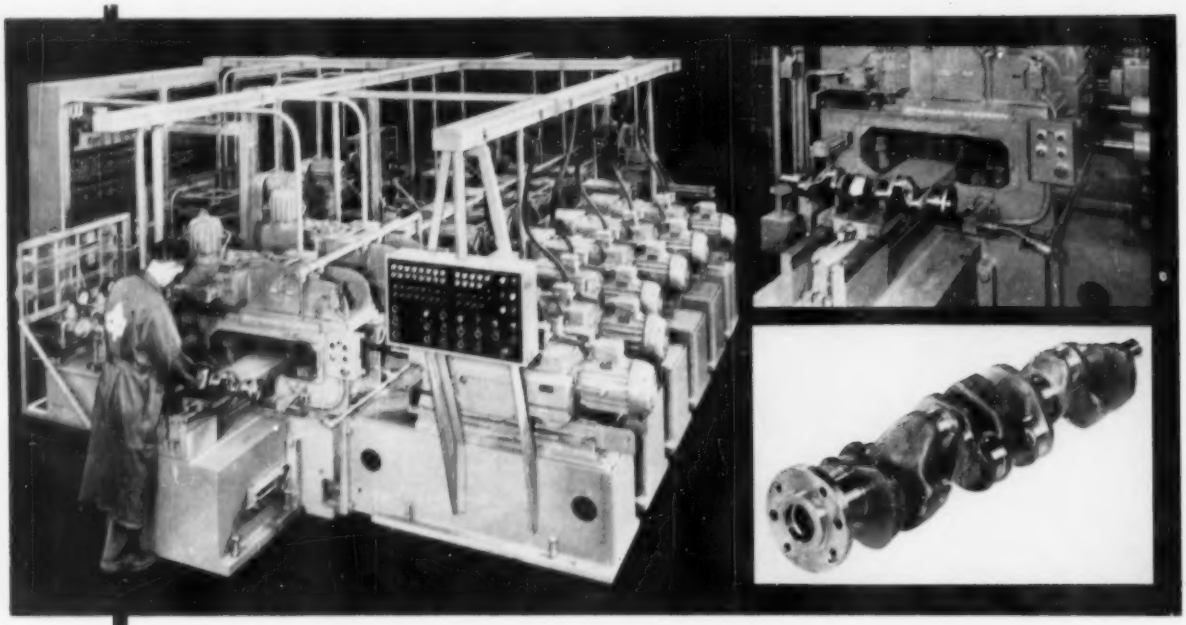
Since 1851
CHUCK

Call Your Horton Distributor Now!

Another Special by **STANDARD–MODERN**



11-STATION TRANSFER MACHINE

performs 36 operations on six cylinder crankshafts

Turning out 60 crankshafts per hour at 100% efficiency, this Standard-Modern equipment combines operations never before accomplished on one "in-line" transfer machine.

Here is a summary of the operations involved:

- Drills, chamfers and taps 4 holes in flange
- Drills, chamfers and reams 2 holes in flange
- Drills, counterbores, reams and chamfers bushing hole
- Finish-bores bushing hole and faces flange
- Mills 2 keyways for timing gear and for pulley
- Drills, chamfers and taps hole in small end

Close tolerances of accuracy in transfer are guaranteed by hydraulic devices that lock shafts on hardened and ground locations on main bearings and crank pin.

The difficult flange boring and facing operation is accomplished by rotation of shafts on carbide locators by an hydraulic collet chuck at the small end. Damage from sudden start and chuck slippage is prevented by a device incorporating progressively increasing RPM.

A specially designed cutter maintains accuracy to within .0005" in milling position of the keyways.

Other features include motorized track-type chip conveyors and magnetic separation in the coolant system.

STANDARD-MODERN Special Purpose Machines are speeding production, saving time and money for industry on four continents.

STANDARD–MODERN
TOOL COMPANY LIMITED
MANUFACTURING DIVISION

69 Montcalm Avenue, Toronto, Canada • 3030 Walker Road, Windsor, Canada

SP-7

Now SIMONDS Offers You

a Fine Grained, Silicon Killed

LOW CARBON
Flat Ground Steel

This new line is in ADDITION to

SIMONDS FLAT GROUND DIE STEEL

High Grade Alloy Tool Steel
(Oil Hardening — Air Hardening)

Here's a fine-grained, forging quality, silicon-killed steel that opens up the way to important savings on items like jigs, fixtures, patterns, stripper plates, punch pads, die plates, die-blocking shims . . . *and parts that don't require heat treatment or in some instances, just case-hardening.*

This new line of low-cost, LOW-CARBON Flat Ground Steel rounds out the present Simonds line of Oil Hardening and Air Hardening Die Steel. What's more, it has equally fine finish . . . and is made to the same close tolerances, with excellent welding quality and machineability.

Simonds LOW-CARBON Flat Ground Steel is furnished in a wide range of flats from 1/16" to 1½" thick and ½" to 16" wide, and in squares from ⅜" to 2⅞". All sizes come in standard, ready-to-use 24" lengths, individually packaged. Stock sizes are ready now . . . special sizes on order. *Get full details from your Simonds Distributor today.*

TYPICAL CHEMICAL ANALYSIS

C. .18	Mn. .50
Si. .20	Phos. & Sul. .04

Heat Treatment By
Case Hardening Only

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

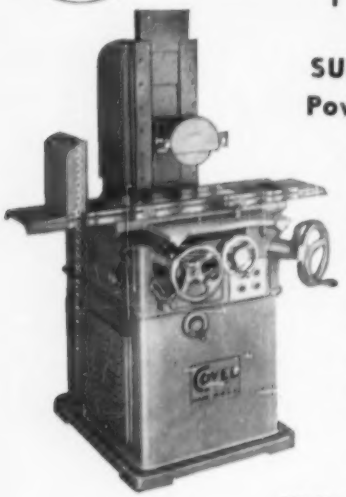
Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

For Fast Service from Complete Stocks

Call your **SIMONDS DISTRIBUTOR**

COVEL

COMBINATION CUTS GRINDING and INSPECTION COSTS!



COVEL NO. 10 SURFACE GRINDER
Power or Hand Feed

Work Capacity—6" x 18" x 15"
Grinding Wheel—7" x ½" x 1¼"

This Covel machine offers a big value at a low price. Gives you these big machine performance features:

- Elevating, traverse feed, and table feed hand wheels grouped at convenient waist level position.
- Hard chrome table ways.
- Smooth timing belt table drive.
- Precision hardened and ground vertical and traverse feed screws.
- Extra engineered weight.

Write for Bulletin TE-127-10

COVEL NO. 14 OPTICAL COMPARATOR
Only $985.00

For fast, accurate optical inspection

Add modern, efficient optical gaging and inspection at a price you can afford. Outmodes mechanical checking methods, prevents costly errors, saves time and money. The Covel Optical Comparator is easy to use. Grinding machine operator can be quickly trained to check his own work right on the job. Large 14" diameter screen is easy to read in fully lighted room. Horizontal stage travel 6". Rugged, precision construction throughout.

Write for Bulletin TE-127-14

Covel offers the widest choice in Surface Grinders up to 14" x 24". Cutter and Tool Grinders. Drill Grinders. Optical Comparators.

COVEL | PRECISION GRINDERS

Benton Harbor, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-232-1

New HYDRA-LOCK EXPANDING ARBOR

The ONLY Arbor Expanded with HYDRAULIC PRESSURE

"ARBOR ON ARBOR"

The HYDRA-LOCK principal has many other uses other than arbors and chucks.

Fixtures • Gages • Special holding and locating devices

HYDRA-LOCK is a patented, hydraulically expanded, precision tool, for internal or external chucking of parts or tools, for all types of machining, grinding and inspection operations. HYDRA-LOCK Arbors are expanded by a self-contained hydraulic system, which assures you of the only true, equalized, accurate centering force.

The base arbor completely fills the I.D. opening. Because there is no line contact, there is no wobble of the part during machining. This results in better finish, squareness of faces, and guaranteed concentricity.

The "Arbor on Arbor" consists of a base expanding arbor, on which you can use sleeves or wheels of any size. You get the same expansion on the O. D. of the wheel as on the base arbor. In many instances, only one base arbor is required to do a variety of holding applications.

Some territories available for Dealers or Distributors.

A & C ENGINEERING COMPANY

12024 E. NINE MILE ROAD • WARREN, MICHIGAN

USE READER SERVICE CARD; INDICATE A-12-232-2

You Can Rely on a

ROUSSELLE

DEEP THROAT PRESS | HORN PRESS | O.B.I. PRESS | DOUBLE CRANK PRESS

THESE 40-TON PRESSES

take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are very moderately priced.

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

Choice of 25 models in 5 to 40-ton sizes.

Manufacturers of Rousselle Presses

SERVICE MACHINE CO.

2310 WEST 78th STREET
CHICAGO 20, ILL.

USE READER SERVICE CARD; INDICATE A-12-232-3

Special Punches and Die Buttons

have R-B Standardized Features

Special punch-points and mating die buttons of any shape or size can be made to your specifications and will have all the features of standard R-B equipment. These inherent R-B features include: snap-action radial alignment and vertical locking of special punches and die buttons, speed and ease of insertion or removal, and complete interchangeability. Just a push, a twist and "click" the R-B punch or die button is locked in the retainer—no additional keying required.

No other manufacturer of punches and die buttons can offer you the amount of successful application experience and the scope of knowledge that is available from the R-B engineering staff for:

- ★ Cutting Your Production Costs
- ★ Reducing Die Designing Time
- ★ Increasing Productivity of Presses
- ★ Supplying Answers to Piercing Problems
- ★ Saving Die Construction Time
- ★ Complete Standardization of Press Tooling

For Additional Information or Engineering Service, Write to:

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 87 • 26490 CAPITOL AVENUE • DETROIT 39, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-12-233

You wouldn't cut out paper dolls with a hedge clipper!!

Then why shear 6-inch wide material with a 10-foot shear?

Cutting a small piece of light metal, plastic or rubber on a big shear is even more expensive than it is exasperating. Yet many shops, out of necessity, tie up big shears with small work.

That problem is solved by the New Lodge & Shipley 24" Speed Shear. Specially designed for fast cutting of small pieces, it has a capacity of ⅛" x 24" mild steel. Its unique work table is provided with holes which allow fast set-up of guides, templates and protractors for production of straight-side blanks at speeds up to 120 strokes per minute.

A 24" Speed Shear may easily pay for itself merely in freeing a big shear from wasteful small jobs. Investigate its possibilities in your plant. For detailed Bulletin No. PS-12, write: **The Lodge & Shipley Co., 3077 Colerain Ave., Cincinnati 25, Ohio**

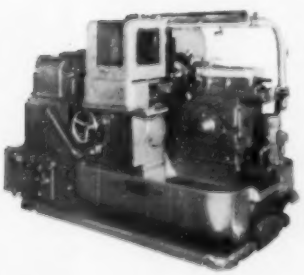
Lodge & Shipley

DO YOU NEED FLEXIBILITY?

TAREX HAS IT

...AND HERE'S HOW!

The illustration shows a Tar-H Machine with 2-9/16" bar capacity, 7" dia. chucking capacity, and . . .



- A front slide with length- and cross-wise feed, using standard camming
- A rear slide that will single point angles up to 30°
- Two vertical slides
- A hydraulic tracing unit that will generate irregular sufaces with single point tools
- A multiple drillhead with drill speeding feature, spindle brake and positioning
- An 8-position turret

ALL THESE FEATURES, AND OTHERS, VARIABLE AT WILL!

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

Pangborn Hydro-Finish cut cleaning time 50% in this plant

Paid for itself in only six months

Pangborn Hydro-Finish really paid off for this leading glass manufacturer. Cleaning quality increased moldlife 10% to 15% and total cleaning and polishing time was cut in half! The resultant savings paid for the machine in six months and represented a substantial weekly sum thereafter.

USE PANGBORN HYDRO-FINISH FOR:

Deburring • Surface finishing • Finishing threaded sections • Improving cutting tool life • Maintaining dies and molds • Removing grinding lines • Removing heat treat scale • Preparing surfaces

Today, through new design and use of air jet sluriators, Pangborn Hydro-Finish costs less originally, costs less to maintain and gives you easier handling and added efficiency. Write for Bulletin **1403** to PANGBORN CORP., **4700** Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-236-1

THIS REVERSE STAMP

Hoggson Brand Reverse Stamps are designed for stamping molds for making rubber, plastic and glass products and for marking die sinking molds and forming dies.

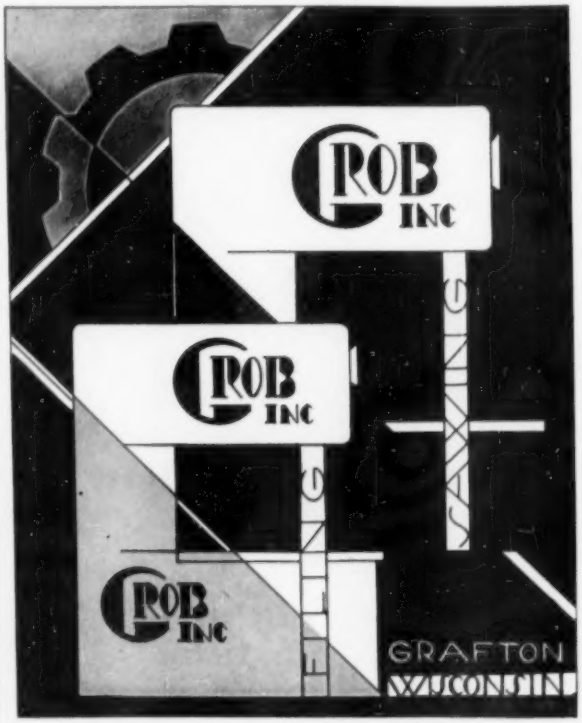
Made of high alloy steel, specially heat treated to withstand continuous impact, they are made for marking flat or contoured surfaces, and are GUARANTEED ACCURATE.

Available from stock in letters and figures from 1/16" to 3/8", Hoggson Brand Reverse Stamps are also supplied, hand cut to your order, as symbols, trademarks, or other special designs.

Specify Hoggson Brand Reverse Stamps. They're a step in the right direction!

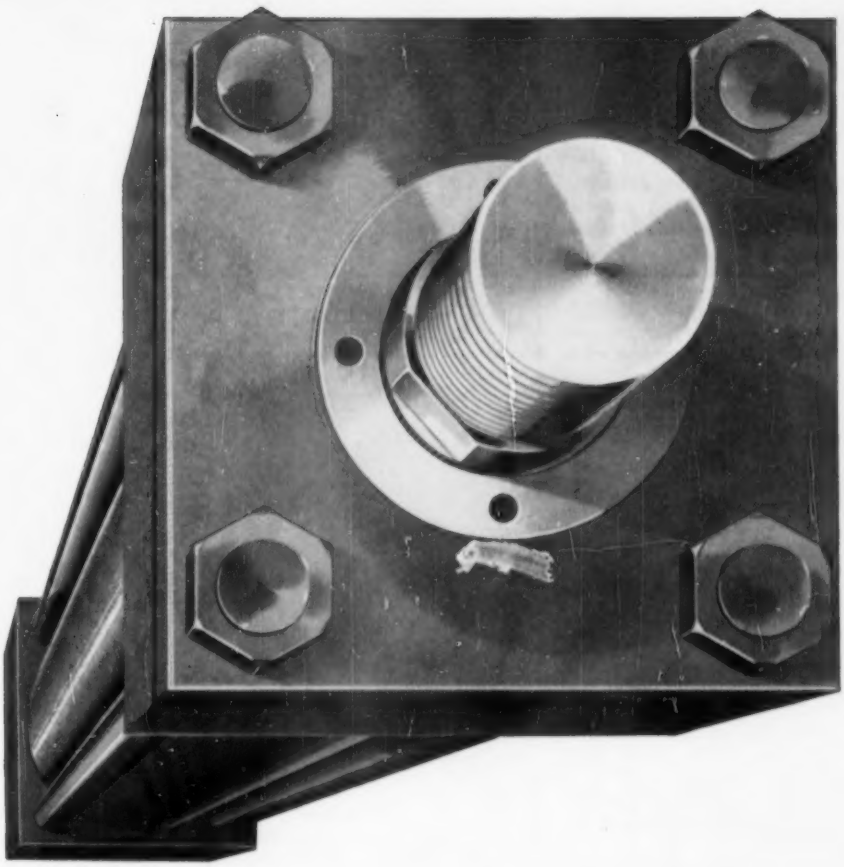
HOGGSON & PETTIS MANUFACTURING CO.
144 Brewery Street New Haven 7, Conn.

USE READER SERVICE CARD; INDICATE A-12-236-2



USE READER SERVICE CARD; INDICATE A-12-236-3

AT YOUR REQUEST...



ANKER-HOLTH

Hydraulic Cylinders now available in Square Head design

Positive Trouble-free Performance

Anker-Holth Division, for 18 years designers and manufacturers of quality air and hydraulic power cylinders, now offers a standard line of all steel, high pressure square head tie rod cylinders. Important new operating features and design achievements assure positive controlled power for a wide range of industrial applications.

Standardized Mountings for Interchangeability

Conservatively rated at 2000 P. S. I. working pressure and 3000 P. S. I. non-shock pressure every cylinder is proof tested at 4500 P. S. I. All mountings are available, standard bores from 1½ to 8 inches. Standardized mountings provide complete interchangeability with most makes of square head cylinders. The Anker-Holth "□" line meets all J. I. C. specifications.

For more information contact your local Anker-Holth representative or Anker-Holth Division, Port Huron, Michigan. YUkon 5-7181

ANKER-HOLTH DIVISION
THE WELLMAN ENGINEERING COMPANY
2730 CONNOR STREET, PORT HURON, MICH., U. S. A.

Talking About Die Sets

with

Phil Marsilius

Executive Vice-President
The Producto Machine Co.

How to Select and Order a Catalog Die Set—Do you always order the die set you *really* need for the job...or do you overlook a specification which results in your having to "make do" with the set you ordered or lose time by having to re-order?

Once again, we feel that a simple and basic practice should be emphasized because our daily experiences show that even the most painstaking individual occasionally overlooks one or more factors in preparing to place an order.

Here is our suggested check-list for selecting and ordering a catalog die set:

1. Lay out the die. Allow sufficient area for feeding devices and auxiliary stock guides that may be required. Determine also what areas must be left clear for part ejection or scrap.

2. Determine type of set you need—rear two-pin, four-pin, center-pin, etc.—according to tolerances and construction of die.

3. Place layout on templates for the type of die set you have chosen. Select die area that best meets the limits established in Step 1.

4. Select material for die set—semi-steel, all-steel or combination—based on the die's strength requirements.

5. Select thicknesses of punch and die holder in line with strength requirements and allowable press shut height.

6. Determine length of guide-pin required*, based on length of stroke or ram clearance.

7. Determine type and length of bushing and material from which it should be made, based on accuracy, speed of operation and required life expectancy of die.

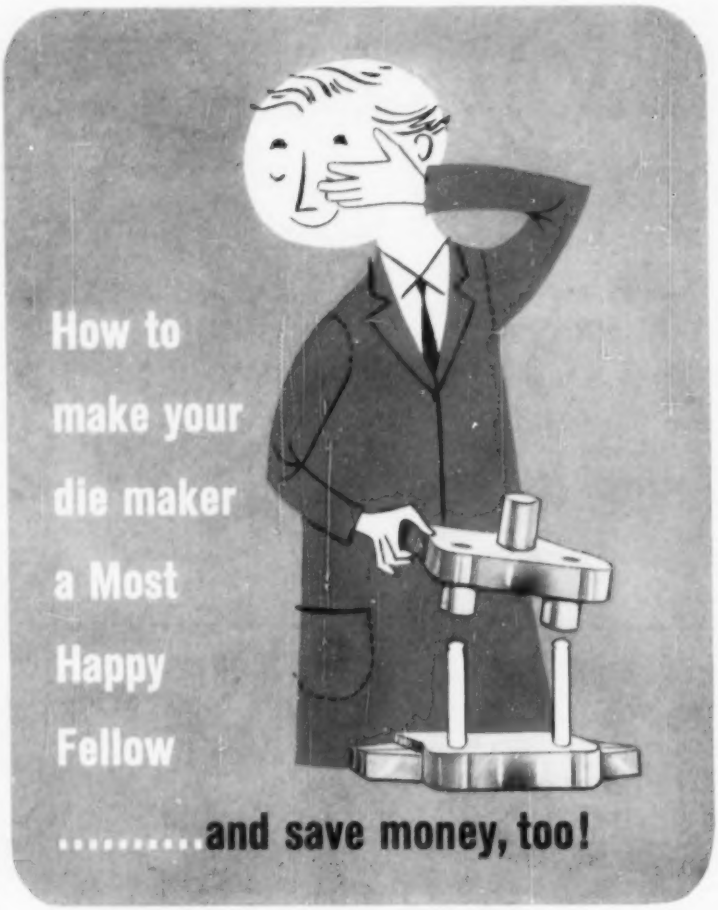
8. Select shank diameter for the press on which die will be run.

9. Choose grade of precision required—Master or Commercial—based on tolerances and number of pieces to be produced.

10. Order die set which meets most closely the above requirements, making certain that *all* ordering information is included: Catalog number and quantity; Master (Precision) or Commercial grade; length of guide pin; type of bushing; diameter of shank or "no shank"; how to ship. Keep in mind that special thicknesses of punch holder and die holder can also be ordered if required.

Of course, you may not find it possible to check these points in the exact sequence presented. However, if you will make it a habit to use this check-list for each die set you need, you can avoid making costly errors in ordering.

*"L" dimensions pertaining to pin length as shown in die set catalogs refer to distance from bottom of die holder to top of pins. They do not necessarily apply to actual guide pin lengths.



It's easy. Just be sure to specify Producto die sets with *Qwik-Fit guide pins.*

Then your die maker will always be able to assemble and disassemble his die sets practically blindfolded! No longer will he have to line up pins and bushings cautiously...tediously hammer die sets together...or pry them apart. With Qwik-Fit guide pins, the die set almost *puts itself together.* The spherical-angular radius on these pins prevents jamming or cocking *regardless of how the punch holder is started on.*

Think of the time your die maker will save...and the money *you* will save. Dies are growing more complex daily and that means assembly and disassembly of the die set dozens of times. In plants all over the country, Producto's Qwik-Fit pins are saving up to 75% of the time formerly required for these operations.

To improve morale and increase productivity, join the growing ranks of die manufacturers and users who specify "Producto die sets with Qwik-Fit guide pins." They are available on Master die sets at no extra cost.

HOW TO MAKE ORDERING EASIER:

Get your free copy of Producto's Die Set Catalog No. 11, designed specifically to simplify your selection and ordering job. And ask to receive the idea-filled Die Set Digest, too.

THE PRODUCTO MACHINE COMPANY
930 Housatonic Avenue, Bridgeport 1, Connecticut

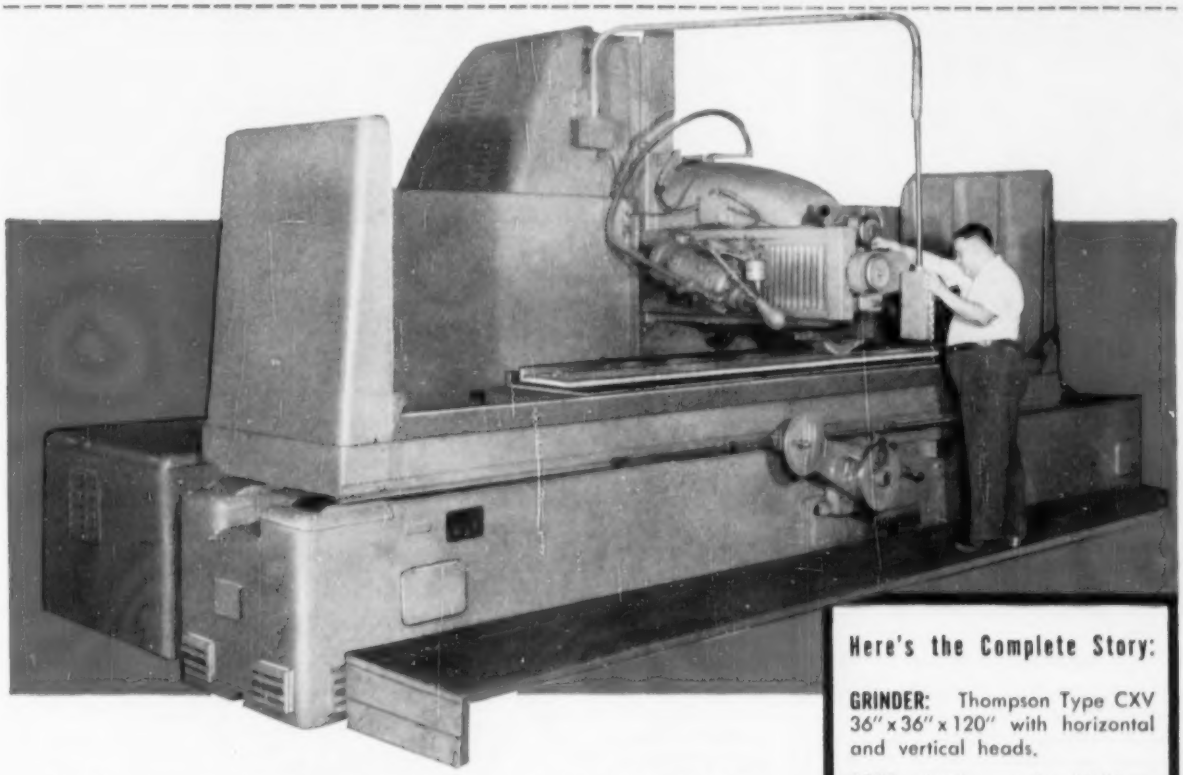
Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

When large parts must be ground to total tolerances of .0005" or less . . . .

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM SOLVE THE PROBLEM!



Machine ways up to 118" for The Michigan Tool Company's Roto-Flo Spline Rollers must be ground to .0005" total tolerance. Heat distortion, caused by hydraulic heat, became a critical problem in achieving this tolerance.

During the three months of operation since the installation of Thompson's new Hydra-Cool Hydraulic System*, these long ways are being ground to consistent .0003"-.0004" total tolerances. Heat distortion is eliminated. Scrap loss is reduced to zero. Grinding time is greatly reduced.

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM MAY BE THE ECONOMICAL SOLUTION TO YOUR GRINDING PROBLEM. WRITE TODAY FOR FULL PARTICULARS.

Hydra-Cool also offers you these exclusive advantages:

- Heat damage to hydraulic seals, valves, controls and pump is eliminated.
- Break down of additive-type hydraulic oils is prevented—sludge will not form in the Hydra-Cool System.
- Lengthy warm-up periods are eliminated.
- Power costs are greatly reduced.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

Here's the Complete Story:

GRINDER: Thompson Type CXV 36" x 36" x 120" with horizontal and vertical heads.

PART: 118" way for Michigan Tool Co. Roto-Flo Spline Roller.

RATE OF TABLE TRAVEL: 100 ft./Min.

MATERIAL REMOVED: .065".

METAL: Flame hardened Ductile Iron.

WHEEL: 20x4x12 H Grade.

SCRAP LOSS: None.

GRINDING TIME: 3-4 hrs.

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO., Springfield, Ohio, U. S. A.

*Pat. Applied For

*"Keep **THOMPSON** in mind for that daily grind"*

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-12-239

Unique Head on Drill Press Speeds Production 2½ Times

Drilling 5/32" holes 3/8" deep, in tough forged rivets is a requirement in the production operations of the Bradley Washfountain Company, Milwaukee, Wisconsin.

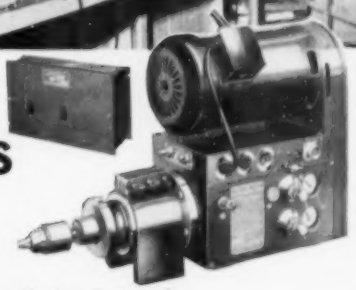
Former methods produced only 125 pieces per hour with very high drill breakage due to the hard stringy metal. How to reduce drill breakage and increase production was an ever present problem with this manufacturer.

New Head Tried

In an attempt to solve it, a special automatic drill unit, with all operating and control mechanisms built-in, was set in place of the standard head on the drill press regularly used for this work. A cycle timer and unloading chute were added to complete the new set-up. Note the special mounting bracket, an accessory supplied by the manufacturer, used to secure the new drill head to the standard drill press column. Because more accurately controlled precision feeds and speeds are possible with this new drill head, these remarkable new production results were achieved:

1—no drill breakage
2—333 pieces per hour—
2½ times former production
3—lower unit cost

This unique drill head is a completely new and different production tool. It is the Dumore Automatic Drill Head, Series 24, designed for single or multiple unit operations where versatility and flexibility are necessary to meet the varying conditions and frequent changeovers of diversified manufacturing. In this case, it proved its worth on one set-up. When desired, it can be moved quickly and easily to numerous other operations with minimum time loss. For further information about this and other automatic precision tools for greater production possibilities at lower cost, write to The Dumore Company, 1310 Seventeenth Street, Racine, Wisconsin.



PRODUCTION RUNS *doubled*

with this New 2-in-1 tool
the DUMORE Series 28 Automatic
"DRILL-N-TAP" UNIT

A large aircraft parts manufacturer uses a bank of 9 "Drill-N-Tap" Units, mounted on standard drill press columns, to get twice as much production per hour at lower cost, over hand methods. This combination set-up handles hundreds of small and large drilling and tapping operations daily. Drill brushings are simply removed when tapping. Tap fits into chuck, no extra head is required. *A flip of the switch controls tapping or drilling.*

This company also uses over 40 Dumore Series 24 Drill Units for all types of production drilling operations. They find that these automatic machines further help to cut costs and speed output all along the line.

A *driller* and a *tapper* . . . all in the same tool . . . at the cost of only one!

It drills or taps without attachments with less tool breakage and scrap losses. No long overhang, or expensive clutches to wear out. Self-reversing motor, electrically controlled, withdraws tap by reversing spindle rotation. Work mounts close to fixture with little tool travel for faster cycling, less idling time.

Mounts in 3 minutes —anywhere — with simple nose mounting bracket, on job after job for production runs in the high thousands or low hundreds. 10 speeds from 265 to 4900 rpm standard.

Available as complete Drilling and Tapping Press with fixture, press and "Drill-N-Tap" Unit, or, "Drill-N-Tap" Unit supplied with bracket to convert your 14" x 17" drill press into a completely automatic drilling and tapping machine.

GET A DEMONSTRATION NOW . . . SEE YOUR DISTRIBUTOR, OR WRITE

YOU CAN DO MORE WITH DUMORE DRILL UNITS
DRILLING • TAPPING • REAMING • MILLING • FACING • TURNING • CHAMFERING • DEBURRING

DUMORE
PRECISION TOOLS

AUTOMATIC
DRILL UNITS
TOOL POST AND
HAND GRINDERS

1310 Seventeenth Street, Racine, Wisconsin

PIONEER ALUMINUM INC.

announces new

921-T DC

DIRECT CHILLED

CAST ALUMINUM TOOLING PLATE

UNIVERSALLY ACCEPTED FOR PRECISION LOW COST TOOL ENGINEERING IN ALL METAL WORKING INDUSTRIES

Direct Chilled 921-T Machined Aluminum Tooling Plate is here, in sizes up to 60 inches wide, 192 inches long and 12 inches thick. Made exclusively by Pioneer Aluminum Inc., the new material is manufactured under processes which control solidification and provide greater density, less porosity and higher mechanical properties to augment the characteristics of standard 921-T.

Pioneer 921-T Machined Aluminum Tooling Plate meets every precision tooling requirement, and at lower cost. Its extreme stability, wide versatility and easy workability effect great savings in tool and jig fabrication. It can be machined at high speed. It is light to handle, and is easily sawed, drilled, tapped, milled or welded. All 921-T plate ¾" thick and over, is guaranteed flat within .010". Insure better, more stable jigs and fixtures; faster and at less cost, by calling out Pioneer 921-T or 921-T-DC.

AVAILABLE
ALL OVER THE
UNITED STATES
...through leading metal suppliers
PIONEER ALUMINUM INC.
SUBSIDIARY OF MORRIS P. KIRK & SON, INC., PACIFIC COAST UNIT OF NATIONAL LEAD CO.
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EASTERN SALES OFFICE: 200 Old Country Road, Mineola, New York
SOUTHWEST SALES OFFICE: P.O. Box 205, Colleyville, Texas
PIONEER

ALBUQUERQUE, N.M.: Morris Steel & Supply Co.
ATLANTA, GA.: Southern States Iron Roofing Co.
BOSTON, MASS.: American Steel & Aluminum Corp.
Joseph T. Ryerson & Son, Inc.
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DALLAS, TEX.: Vinson Steel & Aluminum Co.
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HARTFORD, CONN.: American Steel & Aluminum Corp.
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LOS ANGELES, CALIF. Earle M. Jorgenson Co.
Tool Components, Inc.
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MIAMI, FLA.: Southern States Iron Roofing Co.
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NASHVILLE, TENN.: Southern States Iron Roofing Co.
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ST. LOUIS, MO.: Industrial Metals, Inc.
SOUTH BEND, IND.: Kaole Steel and Aluminum
TULSA, OKLA.: Industrial Metals, Inc.
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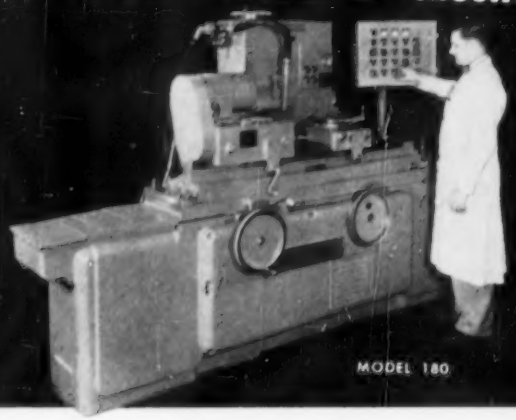
WICHITA, KAN.: Industrial Metals, Inc.

SALES REPRESENTATIVES:

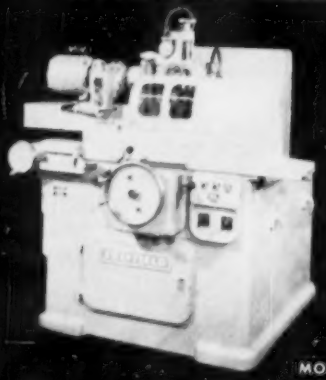
Morris P. Kirk & Son, Inc.
4050 Horton St., Emeryville 8, Calif.
Also: Fresno, Calif.; Phoenix, Ariz.; Salt Lake City

The Norwest Company
330 Second Ave. West, Seattle 99, Wash.

Grind PRECISION FORMS, GROOVES and LANDS *in Record Time* with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS



MODEL 180



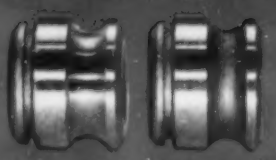
MODEL 109

Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 19, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

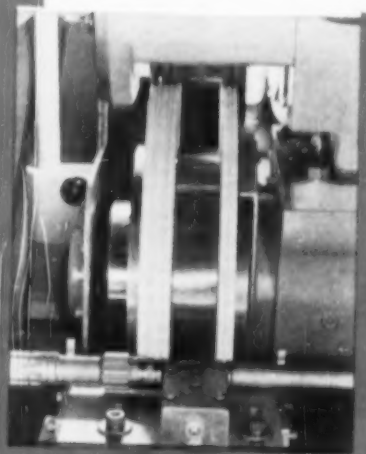


Bearing Race

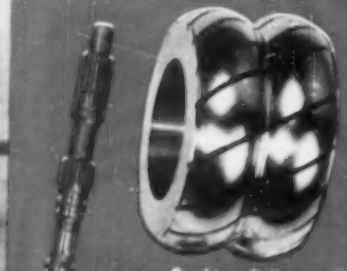
Aircraft Servo Component

Hydraulic Servo Units

Self-aligning Bearings



Grinding Grooves in a Transmission Shaft



Crushtrue Roll

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This is a typical boring set-up. Counterboring and trepanning tools give equally efficient results.

SHELL GARIA OIL 115 specified for

LeBLOND-CARLSTEDT RAPID BORER

. . . the machine that produces deep holes 3 to 8 times faster

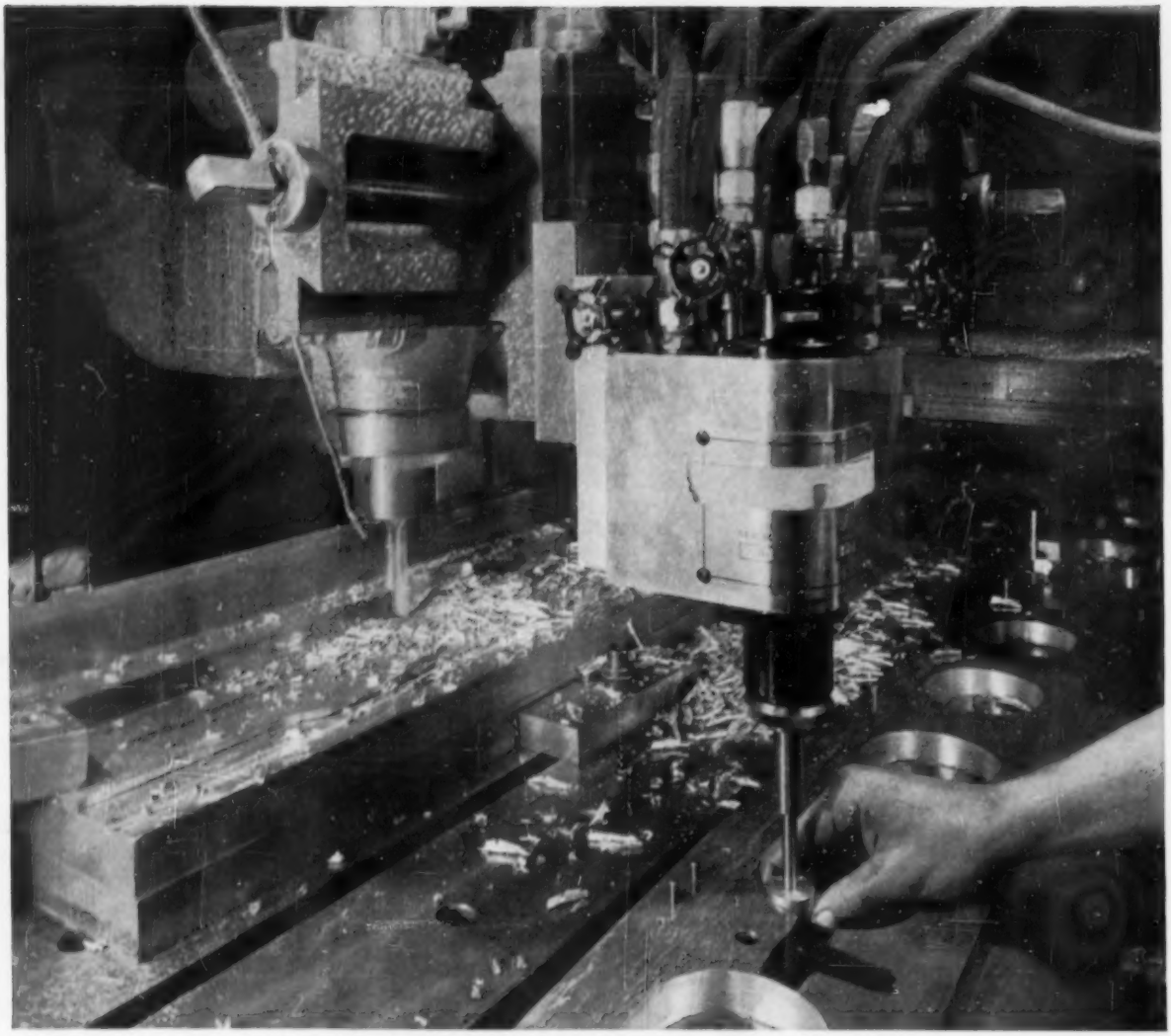
The manufacturers of this new concept in deep hole boring say that the Rapid Borer was developed expressly to accommodate revolutionary new tooling which drills, bores and trepans at high speed with accuracy, and gives excellent finish. Cutting oil is forced between the boring bar and wall of stock, forming a continuous bearing. The oil is forced back through a hollow boring bar, carrying away the chips as it goes. Tool faces are kept clean and chip passage clear. Chips do not come in contact with finished bore.

To insure the success of this operation, a special cutting oil with extreme pressure and excellent cooling characteristics was required. Shell Research went to work, and out came a new addition to the Shell family of cutting oils . . . Garia® Oil 115.

If you are interested in more technical information on Garia Oil 115, write Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL GARIA OIL 115

SHELL



TRACING STYLUS (right) being used on highly accurate magnesium template in profiling operation at American Tapered Wings, Inc.

"Low cost, easy to handle magnesium is an ideal choice for our profile templates"

"We first began using magnesium tooling plate in February, 1956," reports Harold Redpath, Executive V.P. of American Tapered Wings, Inc., Los Angeles.

"We found it entirely practical from the standpoint of strength, and it is lighter, easier to handle and less expensive than either aluminum or steel . . . permits individual workers to move units without using overhead cranes or fork lifts. We used about 7,000 lbs. of magnesium in 1956, saving about $2,000 in tooling metal costs.

"We have been using many of our magnesium templates nine months to a year, profiling aluminum forgings which serve as wing spars, vertical fin spars and longerons. We also use magnesium tooling plate for making many of our drill jigs and milling fixtures."

For more information on low cost, lightweight, easily machined magnesium tooling plate, contact your nearest supplier of Dow magnesium. Or write to THE DOW CHEMICAL COMPANY, Midland, Mich., Department MA-1417U-2.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. Reliance Magnesium Co., Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

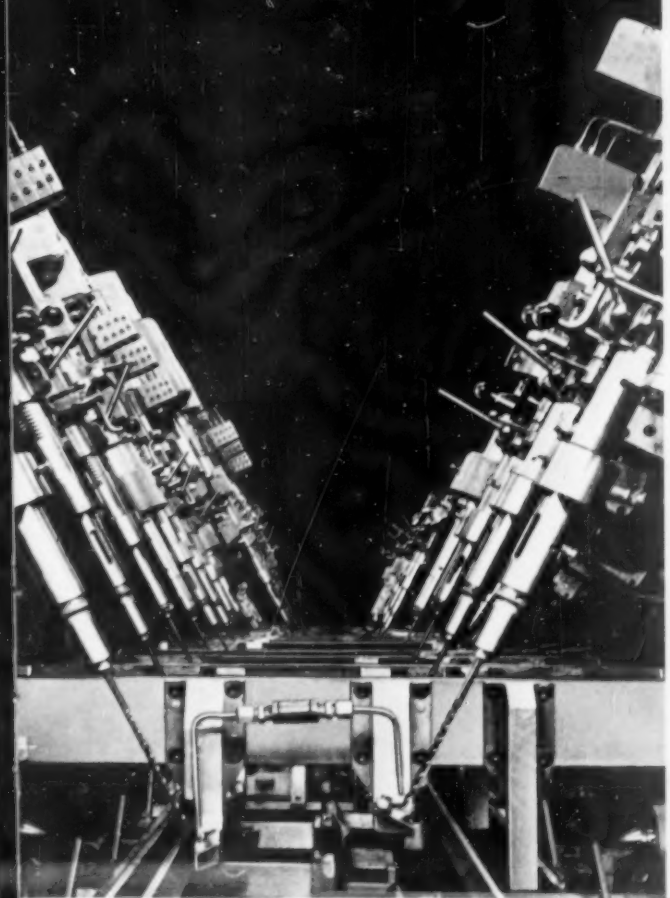
YOU CAN DEPEND ON DOW

WESSON Throw-away Tooling TOOL-NEWS

TOOL NEWS carbide

These suggestions are condensed from Issue #3 of Wesson's publication, "PRODUCTION LINE".

how to cut unnecessary down-time



You can't eliminate *all* machine down-time. Machines do need maintenance and the best of tools can't stay sharp forever.

BUT—

You can eliminate most UNNECESSARY down-time—and it is the unpredictable and unintentional down-time that usually costs the most.

Three main causes of avoidable down-time are: Tool failures, too rapid tool wear, and excessive set-up time.

To minimize these causes we suggest the following as being well worth remembering in selecting, testing, applying, specifying and procuring tools:

For any given job, there is always ONE SPECIFIC carbide grade that is BEST.

Tool Failure

Except for the occasional accident due to hard spots, excess material, momentary power failure, etc., tool failures can be avoided by good tool practices.

The so-called "equivalent" or comparison charts for carbides are deceiving. Time and again, one carbide will stand up on a job while "equivalent" grades break down rapidly. Increase in life of 3 to 1 and 6 to 1 and even more are not un-

(Continued on next page)

WESSON Throw-away Tooling Combines Operations

TOOL NEWS carbide

FIG. 1

With **WESSON** "throw-away" tooling, you can cut the number of separate operations on a part by combining several in a single tool assembly. The reasons:

1. Sharpening of complex tools is eliminated
2. Tool-change time is cut way down
3. Ingenious tool designs let you use throw-away inserts in more places
4. Wessonmetal carbides give long life between "tool changes".

FIG. 1—An example of how separate operations are eliminated by combining tools. This cutter does the lion's share of the work in producing brake-drums for a prominent 1958 car. The twenty tools include six single point brazed tools with screw adjustment, and 15 throw-away insert types. They rough bore the entire drum, chamfer it, plunge cut a face on the OD and a cooling groove between ID and OD.

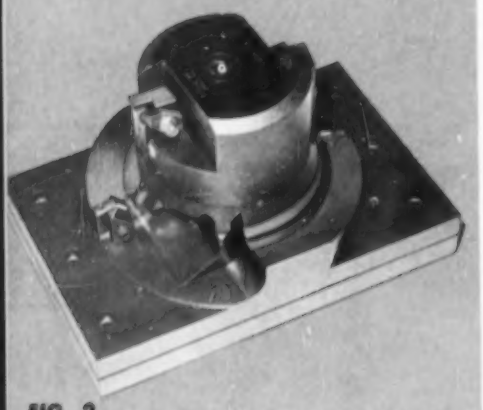


FIG. 2

FIG. 2—Just four identical throw-away tips, ½ inch square, plus one diamond shaped throw-away tip in this tool do all these things on large special pipe couplings: (1) taper bore; (2) relieve; (3) face the end; (4) chamfer the ID; (5) chamfer the OD. Combining these in a single tool has tripled productivity.

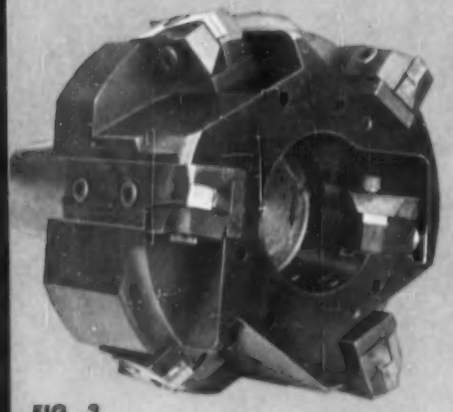


FIG. 3

FIG. 3—Inside a well-known automatic transmission, there is a band-retainer housing with an internal hub. To bore the housing, turn the OD of the internal hub, chamfer the part and counterbore the hub, only one operation is needed. Only one tool is used—a WESSON Multicut boring head. The turning and chamfering tools for the internal hub are micro-adjustable. The entire design is made possible by throw-aways.

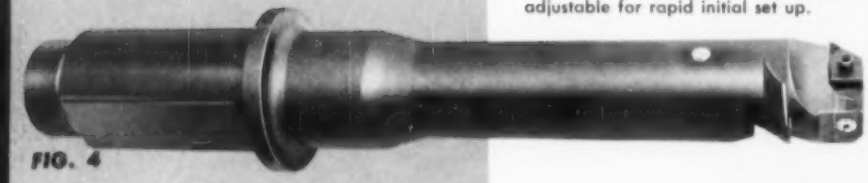


FIG. 4

FIG. 4—There are two opposed triangular Wessonmetal throw-away tips on this tracer-controlled Multicut boring bar. They profile bore the entire complex ID of a turbine part. One tip cuts going in. The other cuts coming out. Both are micro-adjustable for rapid initial set up.

PRODUCTION LINE #3

If you would like a copy of this publication, just jot down your name and title on your company letterhead and mail it to: Editor, PRODUCTION LINE, at the address below.

tools Wesson carbide Wessonmetal

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IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 JUDGE ROAD, TORONTO 18, ONTARIO

How to cut unnecessary downtime

(Continued from previous page)

usual. The decrease in down-time for tool changes is in proportion of course.

Tool Life

The same factors hold true for tool wear. Time and again tests show even so-called equivalent grades varying as much as 2: and 3:1 and up, in pieces per grind—without any variation in feeds, speeds, depth of cut, etc.

Obviously on-the-job tests are an important factor in specifying the *best* carbide grade for the job.

Set-up Time

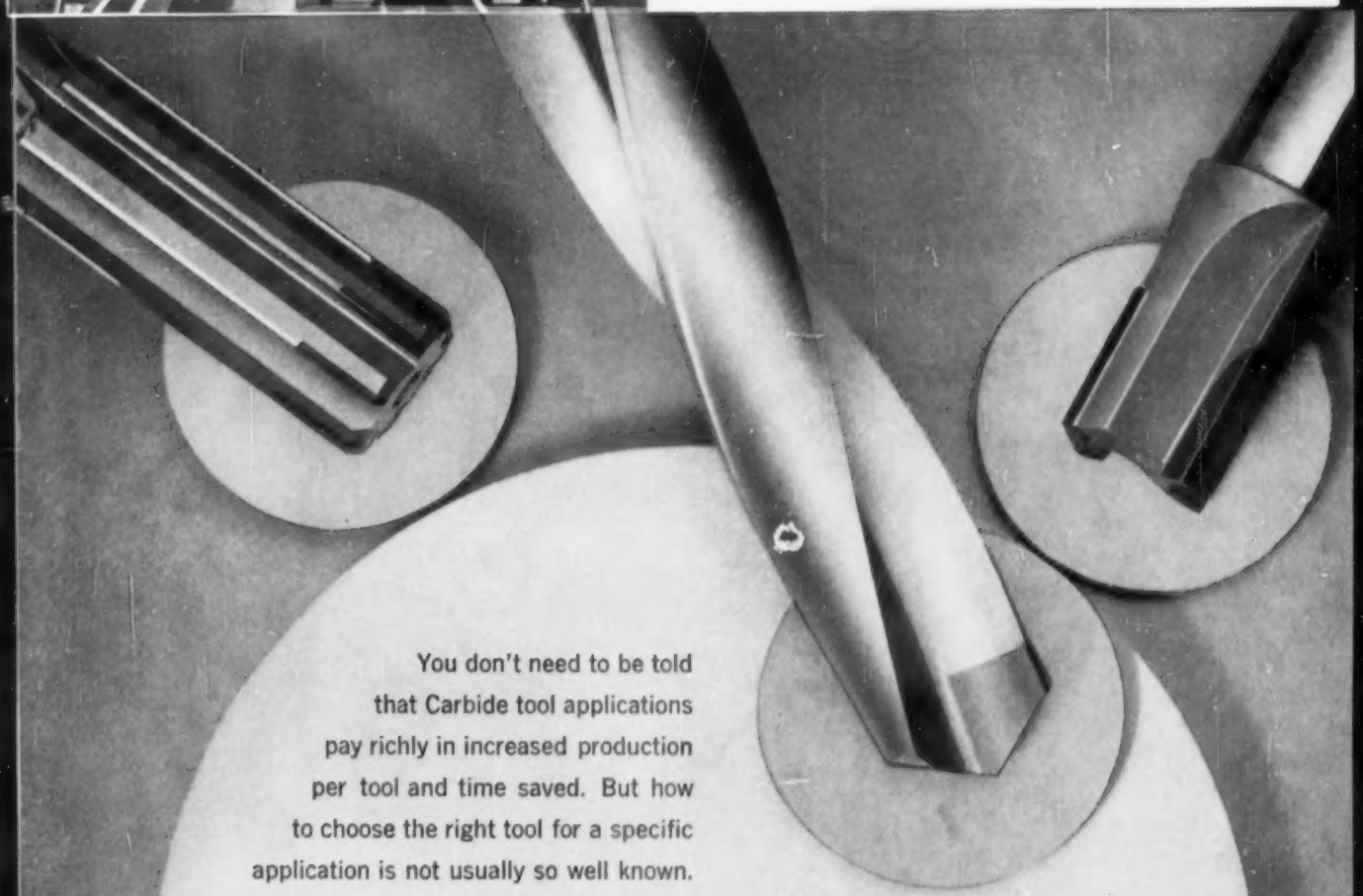
When tooling up, it pays to consider what type of tool will give you minimum set-up time when changing tools. Frequently **WESSON** throw-away tooling will cut down-time enormously. When tool change is necessary you release the insert with a twist of a hex wrench. Index the insert to a new cutting edge. Clamp it with another twist of the wrist. You're ready to go—with the least possible machine time lost.

How to do it

To cut unnecessary down-time, what is needed is a plant-wide cost reduction program that seeks to cut down-time through improved tooling practices.

You can simplify and speed such a program in your plant. Wesson's unique in-plant-engineering service has never yet failed to produce major cost reductions. The same service is available without cost to you on a plant-wide program basis.

Litho in U.S.A.



You don't need to be told that Carbide tool applications pay richly in increased production per tool and time saved. But how to choose the right tool for a specific application is not usually so well known.

THE WHY · WHEN · WHERE

OF CARBIDE TOOL APPLICATIONS

GREENFIELD'S new CATALOG-MANUAL of Carbide tools contains a complete application section — as well as catalog listings and specifications— which should be in every metal working shop.

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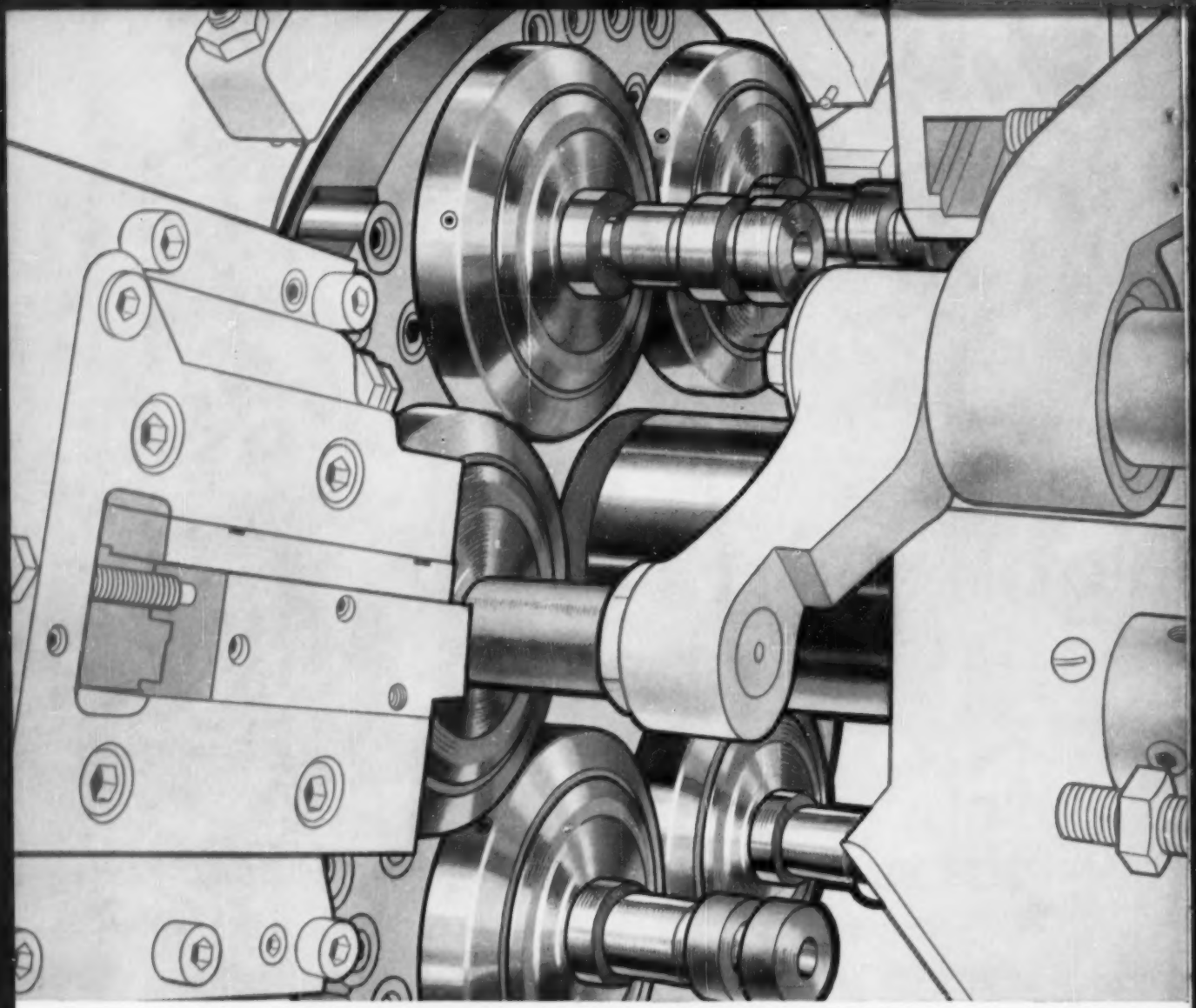
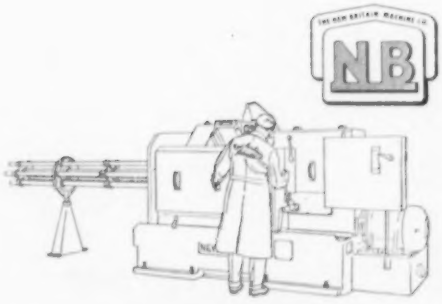
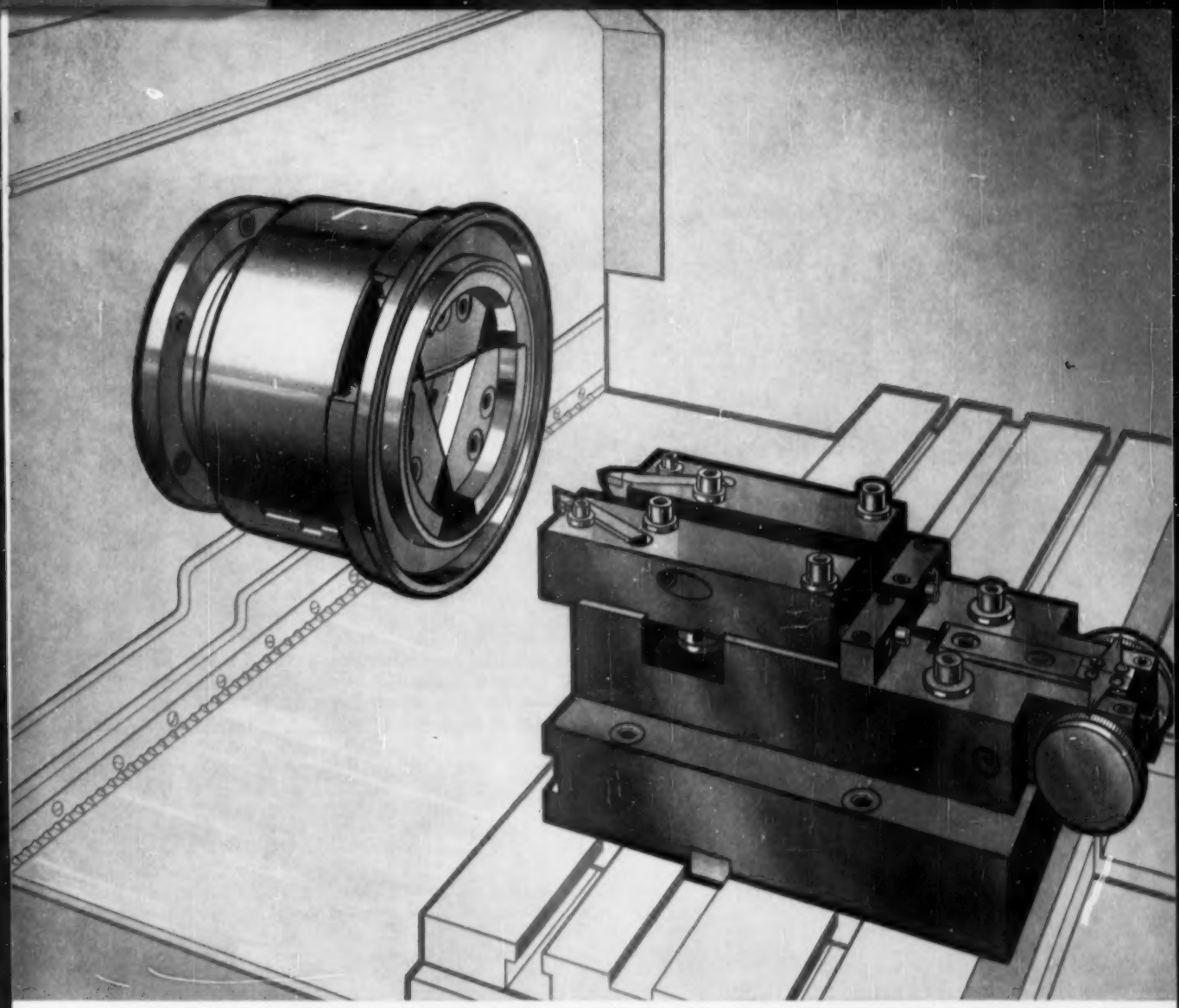


get more bar work done with the widest range of spindle speeds

The New Britain Model 62, 2¼" automatic bar machine illustrated, has a spindle speed range of 117-3,000 R.P.M. No other multiple spindle bar machine in its capacity offers as wide a range of spindle speeds combined with New Britain standards of accuracy. Before you decide on *any* bar machine, be sure to check on *new* developments in New Britains. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Bar Machine



closer tolerances because of cam control

in New Britain precision boring machines

Every piece turned out by a New Britain Precision Boring Machine is accurate in every dimension because of the precision cams which control the slides. Tool wear can be checked by gauging a single dimension per tool of even the most complex contoured piece. There's no substitute for this positive uncomplicated dimensional control when you're working to "tenths." The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

Precision Boring Machine

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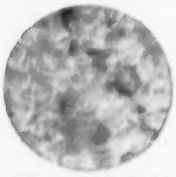
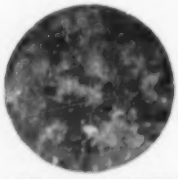
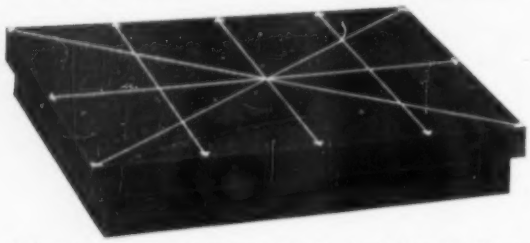


PINK GRANITE



GRAY GRANITE



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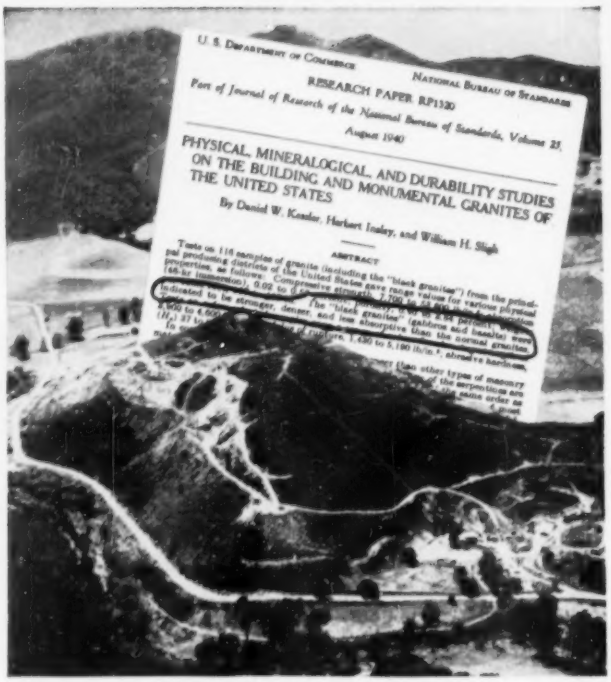
U. S. Department of Commerce — National Bureau of Standards

RESEARCH PAPER RP1320

Part of Journal of Research of the National Bureau of Standards, Volume 25, August 1940

PHYSICAL, MINERALOGICAL, AND DURABILITY STUDIES ON THE BUILDING AND MONUMENTAL GRANITES OF THE UNITED STATES

By Daniel W. Kessler, Herbert Insley, and William H. Sligh

ABSTRACT

Home of DoALL Black Granite-Diorite is this Quarry No. 115 near Escondido, California, which the National Bureau of Standards lists in its research paper R.P. 1320 and Fed. Spec. 666-P-463 as the source of finest Black Granite-Diorite.

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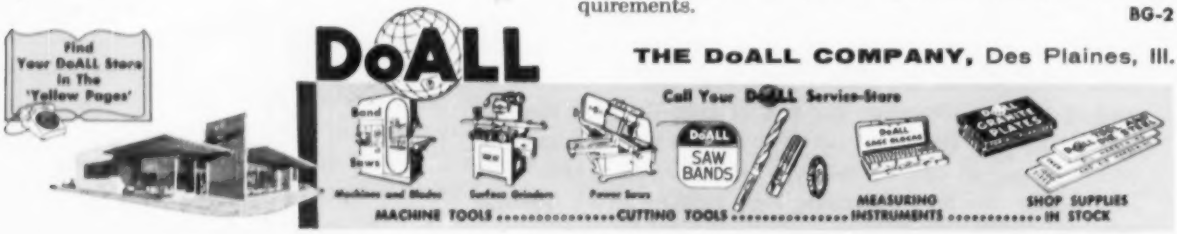
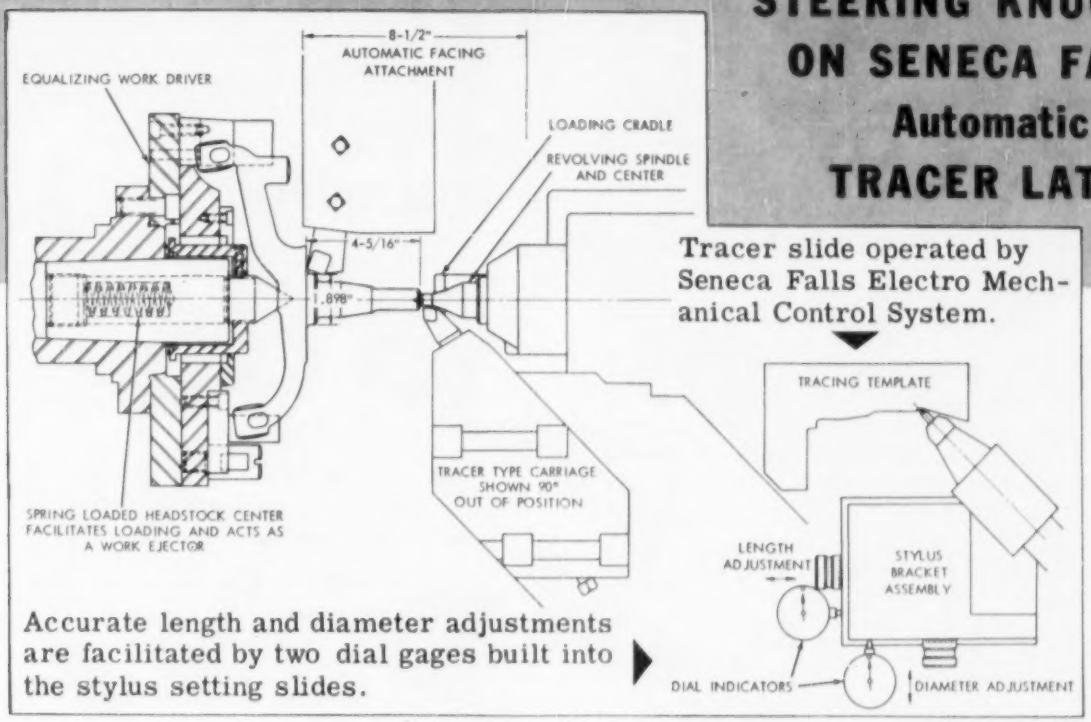
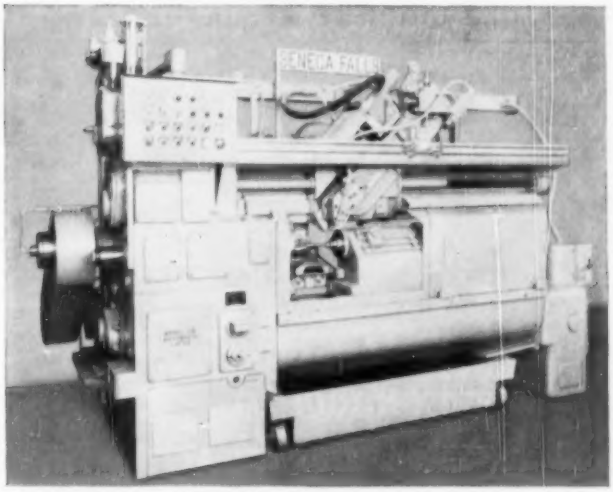


SIMPLIFIED TOOLING CUTS COST OF MACHINING STEERING KNUCKLES ON SENECA FALLS Automatic TRACER LATHE


8-1/2"
AUTOMATIC FACING ATTACHMENT
EQUALIZING WORK DRIVER
LOADING CRADLE
REVOLVING SPINDLE AND CENTER
4-5/16"
1.898"
SPRING LOADED HEADSTOCK CENTER FACILITATES LOADING AND ACTS AS A WORK EJECTOR
TRACER TYPE CARRIAGE SHOWN 90° OUT OF POSITION
Tracer slide operated by Seneca Falls Electro Mechanical Control System.
TRACING TEMPLATE
LENGTH ADJUSTMENT
STYLUS BRACKET ASSEMBLY
DIAL INDICATORS
DIAMETER ADJUSTMENT
Accurate length and diameter adjustments are facilitated by two dial gages built into the stylus setting slides.



SENECA FALLS MODEL LQ Automatic TRACER LATHE

Two cutting tools generate the form required. The rear tool removes excess material from the flange face in a coarse-feed, roughing cut. The tracer-controlled tool finish turns both the stem end and flange face. The two carbide inserts may be indexed or rotated to provide new cutting points in a matter of seconds. Tool setting is practically eliminated!

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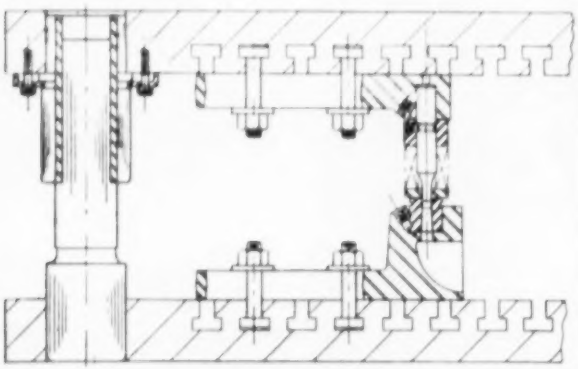
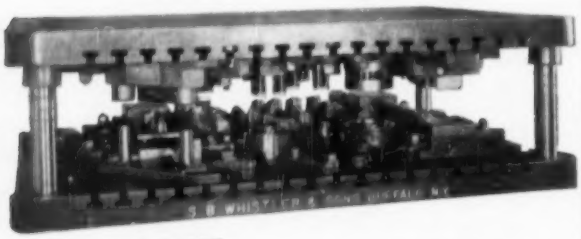
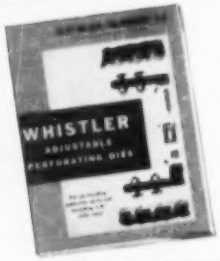


Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.





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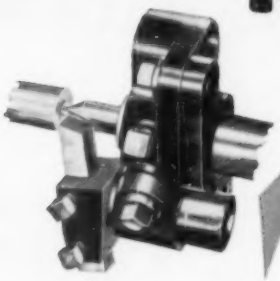
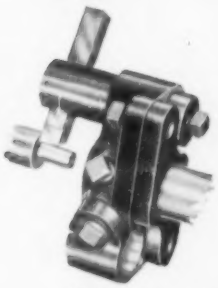


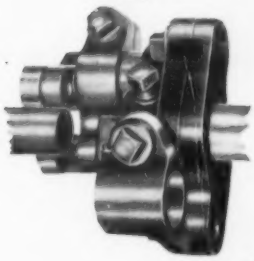
R and L Turning Tool used as BALANCING TURNING TOOL

R and L Turning Tool used as CENTERING & FACING TOOL



R and L Turning Tool used as KNEE TOOL

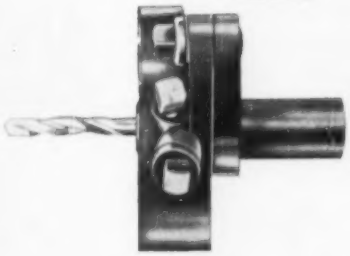
R and L Turning Tool used as BACK REST

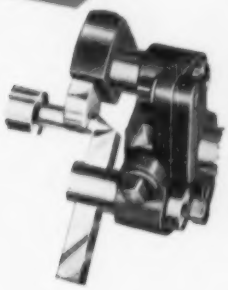


R and L Turning Tool used as ROLLER BOX TOOL

R and L Turning Tool used as FLOATING DRILL HOLDER

R and L Turning Tool used as POINTING TOOL





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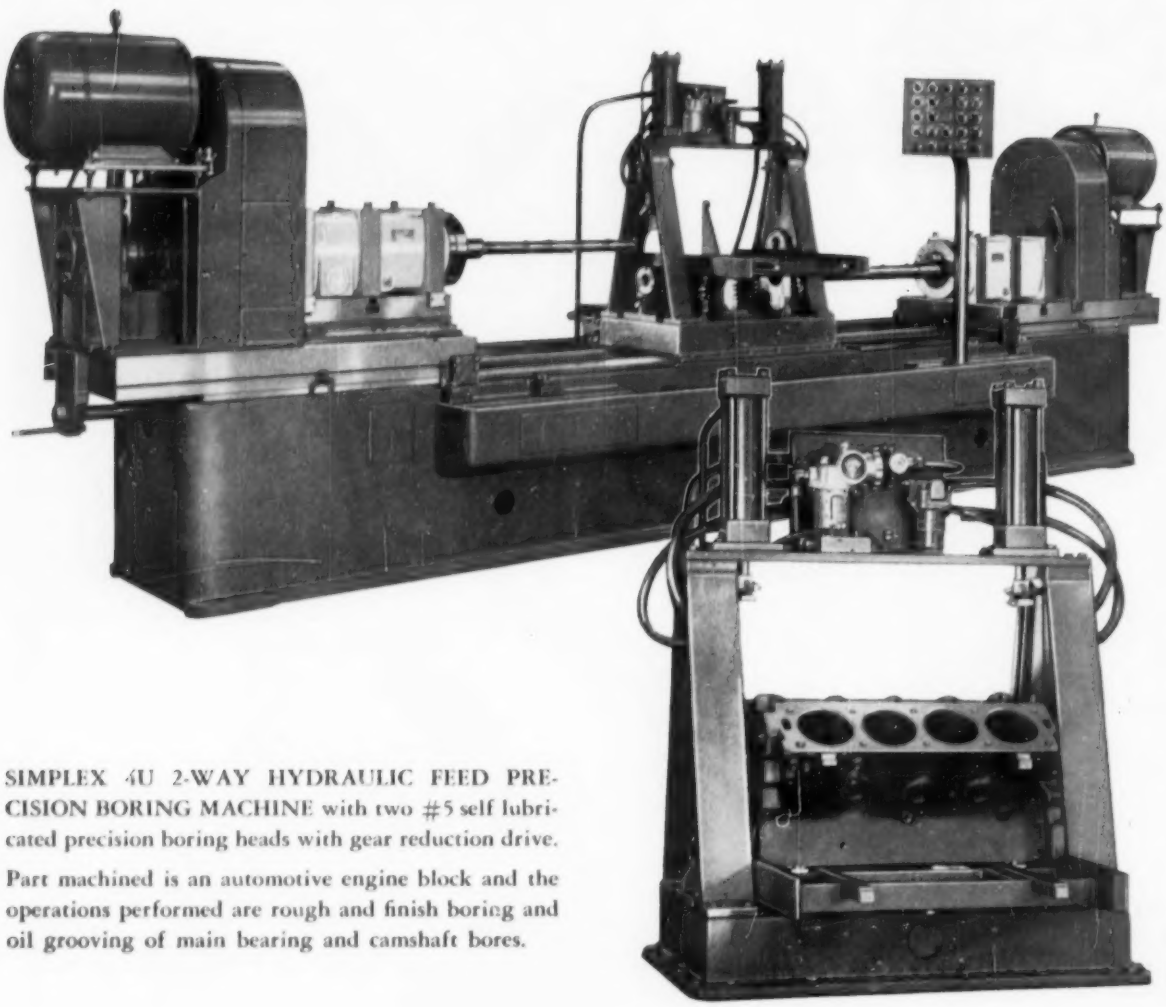
Simplex

PRECISION BORING MACHINES



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Part machined is an automotive engine block and the operations performed are rough and finish boring and oil grooving of main bearing and camshaft bores.

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One man,
one machine,
one pass,
now does the work of six
A winning combination to reduce costs . . .
OK modern milling cutters
mounted on modern milling machines

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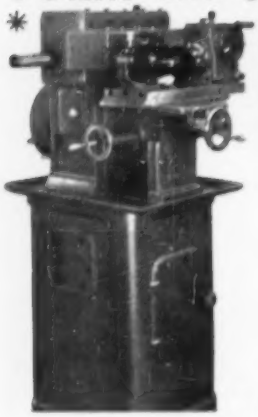
FORM and PUNCH SHAPER



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with the **JEMCO K-150** punch shaper

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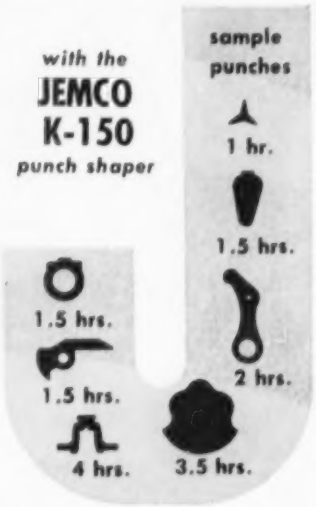

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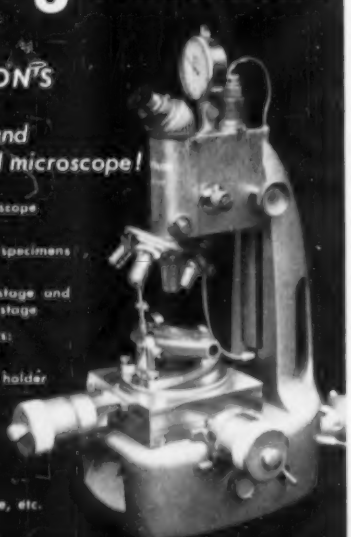
with UNITRON'S Combination Toolmakers and Metallurgical microscope!



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Even the smallest shop can rapidly pay for this versatile instrument in time and materials saved. UNITRON Model TM, with all its features, costs about the same as the lowest priced, simple shop microscope. . . . . fob Boston only **$1050**

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CLARK HOLE MILL—Makes fixed diameter holes fast! One pass on thick stock. Easy starts, curved or irregular surfaces. 1" to 4" sizes; others special.

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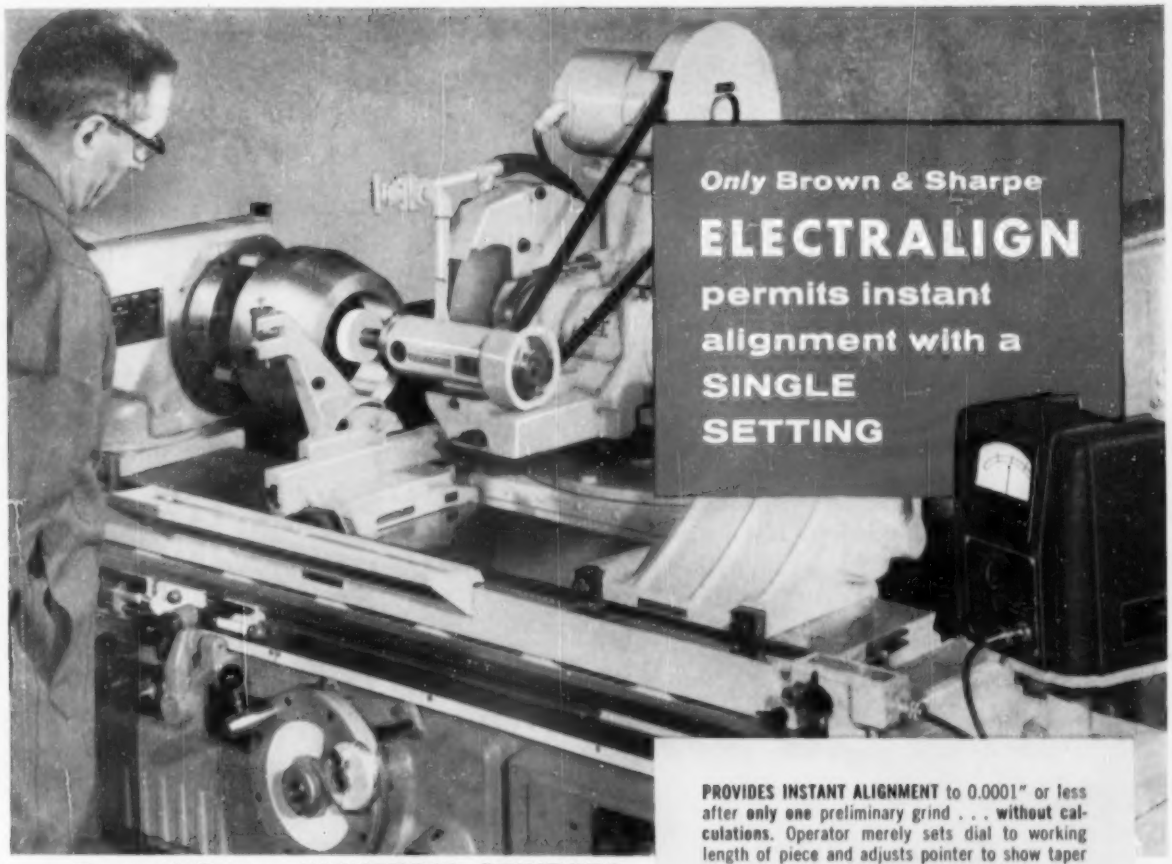

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with ELECTRALIGN — and many other exclusive advantages — are setting cost-reduction records. Write for details.

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ELECTRALIGN has a 10-year record of *proved savings of 60% or more in set-up time,* on all types of cylindrical and taper grinding.

For comparable savings, you need all the features *you can get only in* ELECTRALIGN. Why settle for less? Get the full story of ELECTRALIGN Grinding. You'll see why it holds the lead for speed, simplicity, and precision. Brown & Sharpe Mfg. Co., Providence 1, R. I.

PROVIDES INSTANT ALIGNMENT to 0.0001" or less after **only one** preliminary grind . . . **without calculations.** Operator merely sets dial to working length of piece and adjusts pointer to show taper error. He then swivels table until pointer reads zero, and grinds to finish — with practically full tolerance for sizing.

AUTOMATICALLY COMBINES AND AMPLIFIES the electrical signals from the measuring elements at **both ends** to give **one** easily-read meter deflection proportioned to the angular movement of the swivel table only. Operator is relieved of need to compensate for deviation at each end individually.

A DEPENDABLE "WATCHDOG" that indicates any change in original alignment requiring readjustment. Alignment can be instantly restored.

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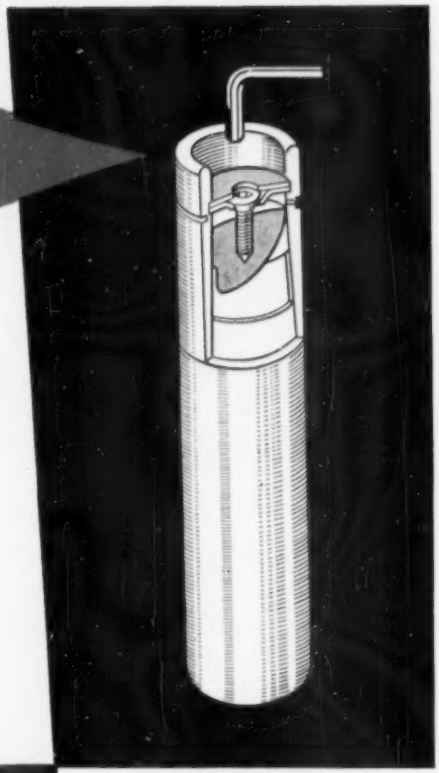
MILLING, GRINDING, AND SCREW MACHINES • CUTTERS
MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS

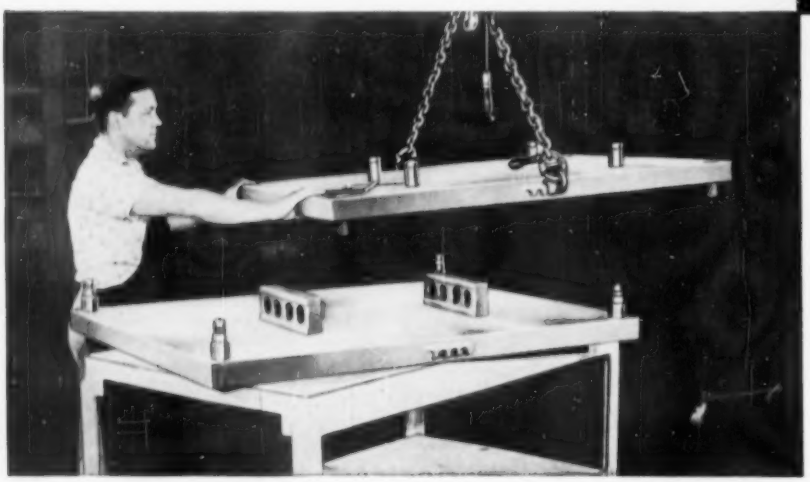
NO DIE SET PARTING PROBLEMS SUPERIOR REMOVABLE CAP GUIDE PINS



NOW on every SUPERIOR DIE SET in diameters from 1½" upward at no additional cost

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can do this work alone in a few minutes.

Standard equipment on all Superior die sets. Specify if desired. Write for complete free information.



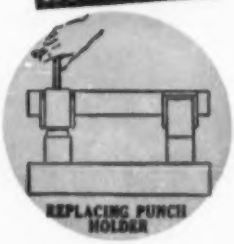
FAST

REMOVING CAP

SAFE

PARTING DIE SET

ACCURATE



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For fast local service call these Expert Superior representatives:

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SUPERIOR STEEL PRODUCTS CORP.
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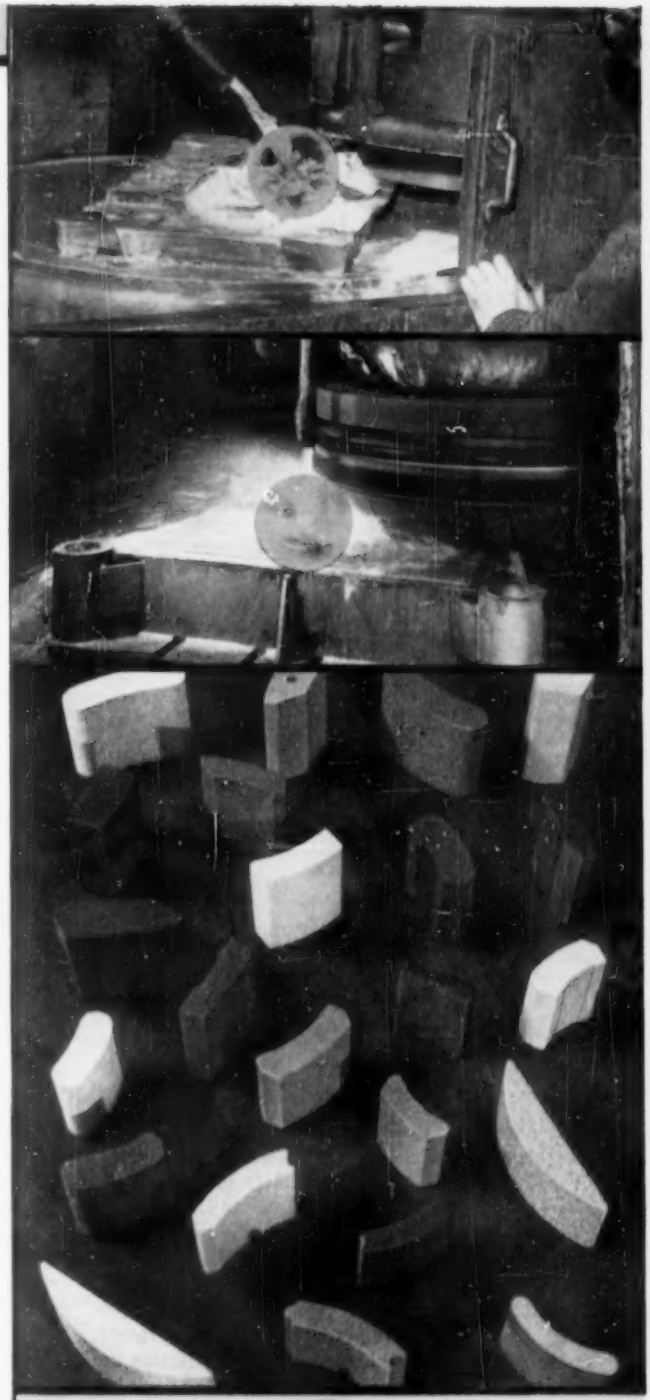
When you surface grind with segments

Take advantage of this COMPLETE Line

. . . and add the profit-boosting "Touch of Gold" to any surface grinder



You can be sure that switching from grinding wheels to Norton abrasive segments brings powerful, profit-building "Touch of Gold" benefits to very many jobs.

Because —

Norton makes segments in every required shape and size and in exactly the right abrasive and bond for best results in the widest variety of surface grinding — on ferrous and non-ferrous metals and on work pieces ranging from boiler plate to the hardest die steels, die sets or blocks.

Norton segments are made in many ALUNDUM* abrasives. Of these, 32 ALUNDUM abrasive is particularly suited for fast stock removal and heavy feeds. 37C CRYSTOLON* abrasive, unequalled on hard cast iron and soft non-ferrous metals, is also available. And diamond segments are also furnished, if desired, for ceramics, quartz and glass.

Bonds include the G and BE — both vitrified — as well as resinoid bonds. Structure can be either regular or the open (induced pore) which is especially advantageous for many jobs. In the field of surface grinding, users have reported that the G Bond — most efficient vitrified bond ever developed — results in new speed and economy.

With this broad range of abrasives and bonds to choose from you can count on much faster production rate at considerably lower costs. And when you mount these cost-cutting segments in Norton chucks — designed to fit several machines — you safeguard performance and profits.

Ask Your Norton Distributor for the booklet, "The A.B.C. of Surface Grinding." Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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Making better products . . . to make your products better

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Coated Abrasives • Sharpening Stones • Behr-cat Tapes

IF YOU HAVE ANY OF THESE PROBLEMS...

Boring Deep Holes

Obtaining Close "No-Taper" Tolerances

Boring at High Speeds and Feeds

Controlling Drag-Out Marks

HERE'S YOUR ANSWER...

KENNAMETAL* ENCASED KENDEX* BORING BAR

Whenever a boring job requires unusual stiffness—and whenever the restrictions on the ratio of diameter to length make it impossible to get this stiffness by "beefing up" a steel bar—you'll find your answer in this new Kennametal Tool.

Because Kennametal has three times the YME of steel, the Kennametal bar body provides the greater stiffness needed to prevent chatter, taper or weaving and resulting spoilage due to drag-out scoring. Furthermore, the "Torque Tube" principle of design concentrates the Kennametal in the area of greatest stress, obtaining maximum benefits with minimum material.

Users have already reported the successful machining of jobs which were impossible to handle before . . . and greatly improved output and quality on jobs that had to be "babied" when ordinary boring bars were used.

In addition, Kennametal encased boring bars permit the use of extremely hard grades of Kennametal in cutting high-tensile steels. The stiffness of the bars prevents the vibration that causes chipping and chatter-damage to the tool, and often ruins the work. Kendex throw-away type inserts permit quick indexing of new cutting edges without affecting the bar setting, and eliminate costly regrinding.

These Kennametal Encased Kendex Boring Bars are available with square or triangular inserts in a number of types and sizes. Even round inserts can be used because of the rigidity of the bar. Special designs for unusual applications can be engineered for you. Ask your Kennametal Tool Engineer for details, or write, outlining your special requirements to: KENNAMETAL INC., Latrobe, Pennsylvania.

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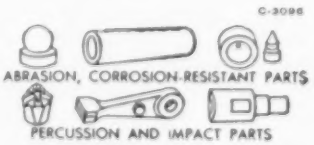
C-3096

INDUSTRY AND KENNAMETAL ...Partners in Progress



BRIDGEPORT BRASS

COPPER ALLOY BULLETIN

Bridgeport Reporting New Developments in Copper-Brass Alloys and Metalworking Methods

TIPS ON MACHINING DURONZE (ALUMINUM-SILICON BRONZE) ROD

by M. A. BUELL
Chief Staff Metallurgist

Our general designation for silicon bronze rod is Duronze. Duronze 707 is one of these alloys and contains 91.0% copper, 7.0% aluminum and 2.0% silicon. This composition makes Duronze a tough, strong and corrosion-resistant alloy suitable for a variety of applications, such as gears, pump parts, pinions, valve parts, etc.

It is this toughness which has to be considered when machining Duronze 707. Although the chip is brittle, its tensile strength is 50% greater than that of leaded brass. Consequently, extra machining power is required. Likewise, tools of a high degree of hardness, such as carbide-tipped tools, should be used. The tools should be set on center, or slightly below, to insure correct front clearance. Any rubbing will result in rapid wear to the tools. Above all, sharp tools are essential.

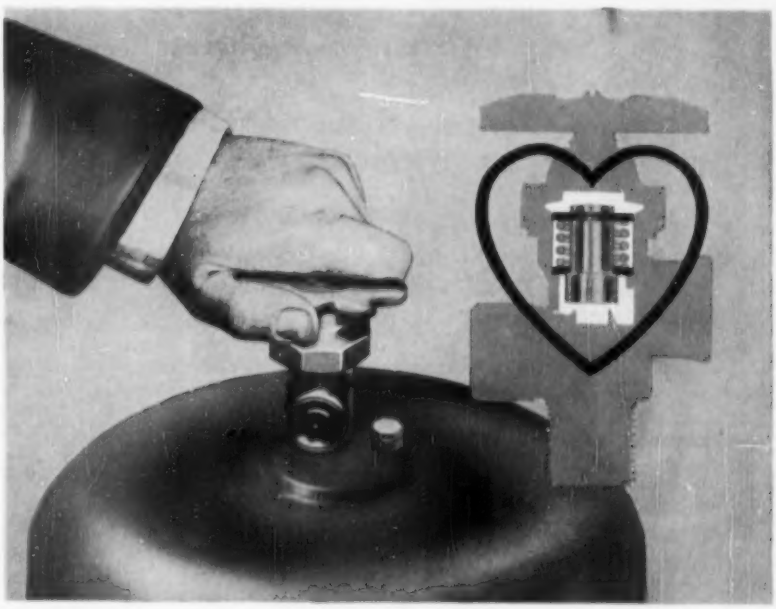
Cooling is most important when machining Duronze 707. The heat build-up, due to friction between the tool and the metal, is considerable. Consequently, the heat must be dissipated with a plentiful flow of coolant. A low-viscosity mineral oil of around 100 Saybold seconds is generally satisfactory. Sulphurized mineral oil can also be used but tends to stain.

Deep cuts should be avoided, but can be handled without trouble by splitting the operation into roughing cuts and finishing cuts. This procedure also helps increase accuracy and helps improve surface finishes since it tends to variations in dimensions and surfaces.

An article of this nature commonly high lights some of the topics involved. More complete information on specific problems—whether on Duronze or any other copper alloy—can be obtained by writing or phoning your nearest Bridgeport Sales Office. Our field men will be glad to serve you.

Propane Valve Uses Duronze* "Heart" For Extra Strength And Trouble-Free Service

*Aluminum-silicon bronze



The cylinder valves that regulate LP gas in home systems must have tough construction, be easy to operate and offer maximum safety. To fill these needs, the Aluminum and Brass Co., Inc. of Lockport, N. Y. makes high-quality propane valves that use Bridgeport's Duronze 707 Alloy for the lower stem assembly—the "heart" of the valve.

Duronze Requirements

These stems must really take it—stand up under severe service, be unaffected by sudden temperature changes and also resist corrosion to avoid freezing or sticking. To meet these tough material requirements, the manufacturer specified Duronze 707—a high-strength, aluminum-silicon bronze alloy that can also be machined to the close tolerances needed for the valve parts.

Solving the Problem

Before Duronze was used, the lower valve stem was made of brass. The constant shutoff action of the valve exerted a crushing pressure on the stem, which in turn developed a concave area in the brass seating member and prevented a gastight seal. Because Duronze is not affected by this shutoff action, this problem has been eliminated.

Matching Metal to Job

These propane valves are another example of how Bridgeport matches the metal to the job. By working closely with the manufacturer, the Bridgeport salesman was able to meet his specifications exactly and help contribute to the over-all superiority of the product. The Bridgeport salesman who calls on you, or our nearest sales office, is always ready to offer you the same service on your products. Call them to use this service to your advantage.

BRIDGEPORT BRASS
Bridgeport Brass Company, Bridgeport 2, Connecticut. Offices in Principal Cities
In Canada: Noranda Copper and Brass Limited, Montreal

What TOOL HOLDER WOULD YOU CHOOSE?

On tapping and reaming jobs, if you had your choice of several types of tool holders and you knew that one of them would not only enable you to make set-ups faster, but would also practically eliminate oversize and bell-mouthed holes, what one would you choose?

Your answer, we believe, would be the same as that of hundreds of others who, upon learning of the many advantages of the Ziegler, have adopted it as a necessity in their tapping and reaming operations.

By reducing set-up costs, reducing spoilage losses and reducing the replacement of guide bushings, the Ziegler Tool Holder pays for itself very quickly. Try it and see!

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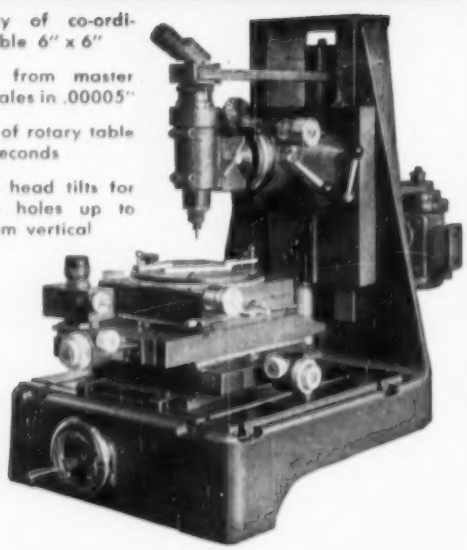
- Capacity of co-ordinate table 6" x 6"
- Setting from master glass scales in .00005"
- Setting of rotary table in 10 seconds
- Spindle head tilts for oblique holes up to 15° from vertical



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OPTO-METRIC TOOLS, INC.
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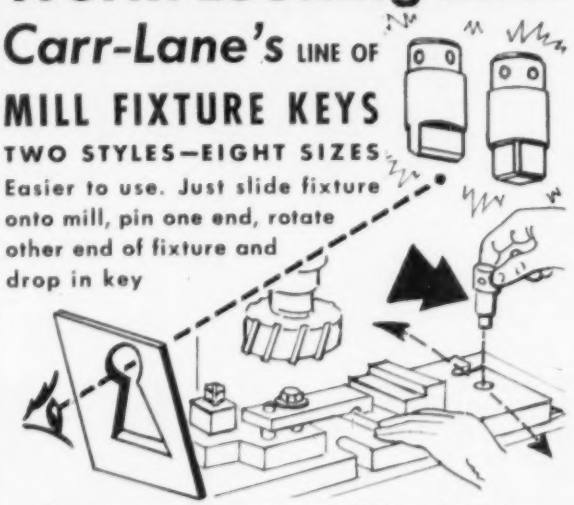
TWO STYLES—EIGHT SIZES

Easier to use. Just slide fixture onto mill, pin one end, rotate other end of fixture and drop in key



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TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 173.

Do You Waste Thread Ring Gage Life? Are You Using Full Ring Tolerance?

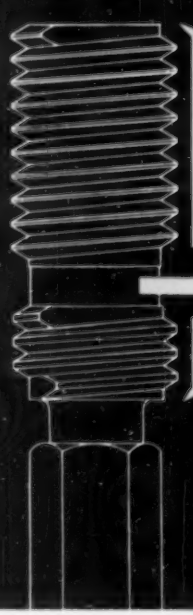
Pipe Machinery Hilo Set Plugs are

The One Sure Way to Tell

Can you be sure your thread ring gages and other adjustable instruments for inspection of male threaded parts are not being scrapped before you have used the tolerance to which you are entitled? If you're employing conventional setting plug gages that depend on the human yardstick . . , the individual operator's sense of feel and snug fit . . . you can't. Chances are you're wasting ring life!

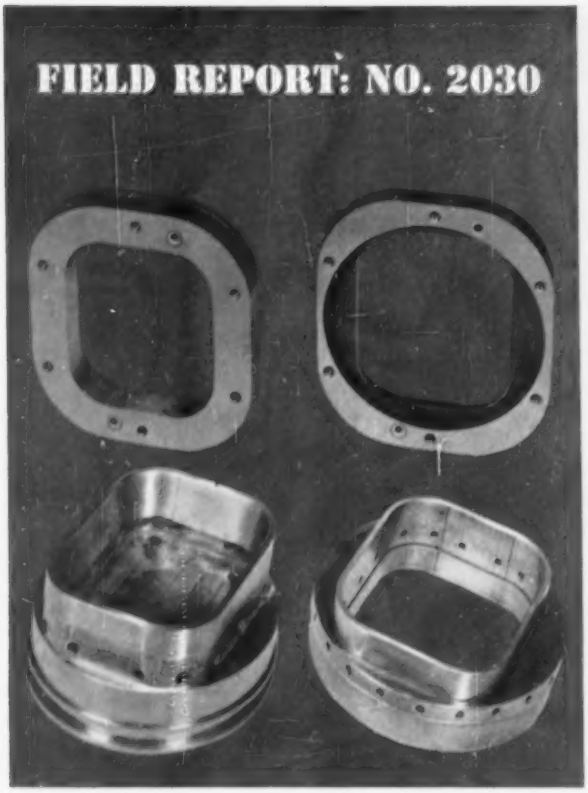
Pipe Machinery's new more accurate Hilo Set Plugs are designed with two sections having different pitch diameters but identical lead and angles. The front end is made to the extreme low limit of prescribed ring gage pitch diameter tolerance—the back end to the high limit. There's no guesswork in sizing and setting. If the smaller end of the plug enters and the larger end is held out, the ring is the proper size for the tolerance specified. You use all the life built into your adjustable thread gages . . . reject them instantly and positively when the ring is out of limits.

Write for additional information.



PATENTED 2789360

THE PIPE MACHINERY COMPANY
29100 Lakeland Blvd. • Wickliffe, Ohio
Greater Cleveland



WHICH DIE STEEL WOULD YOU USE

to get "skin-fit" mating—250 million output?

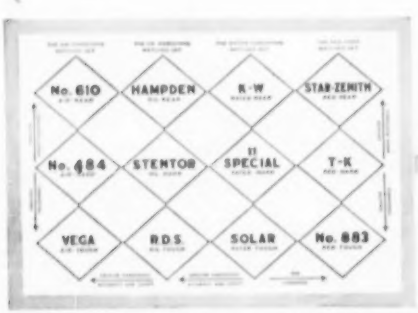
These dies for trimming .003" thick aluminum foil food containers presented the toolroom with this really tough set of tool and die requirements: Make the dies all in one piece . . . finish them to actual size before hardening . . . provide "skin-fit" mating after hardening with no finish grinding . . . and build the dies for multi-million production.

Suppose the decision on which die steel to use were up to you. Would you risk your reputation on any other steel than the one this toolroom decided to use?

Carpenter VEGA (Air-Tough) Die Steel came through with this remarkable performance: After hardening, the toolmaker discovered that the two die sections and two draw rings held to .0003"/.0004" *overall* . . . not just per inch. No finish grinding was necessary . . . a perfect "skin-fit" was assured. Machining the dies from a solid bar of die steel eliminated the need for welded or bolted sections.

The two VEGA rings are engineered to produce a staggering 26 million pieces before any grinding modifications . . . and a total production of 250,000,000 pieces. This Report is one of *hundreds* based upon actual plant records to prove conclusively the improved results obtained with Carpenter Matched Tool and Die Steels.

When will you join the growing number of plants who are enjoying better, lower-cost results? It will pay you to call Carpenter—get in touch with your nearest Carpenter Mill-Branch Warehouse, Office or Distributor today.



Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Company, 154 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

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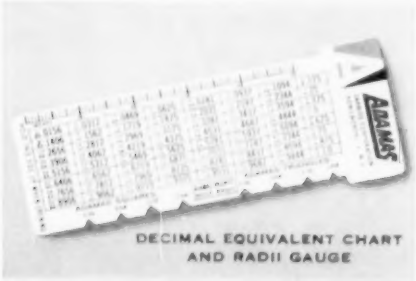
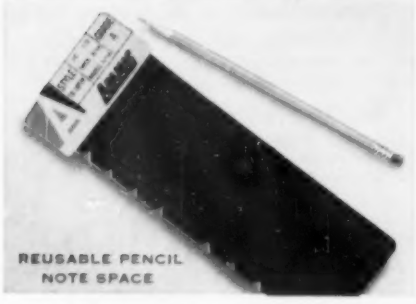
ADAMAS Top Performance Throwaways

now packaged to give you extra production efficiency

Check these outstanding features:



DECIMAL EQUIVALENT CHART AND RADII GAUGE



REUSABLE PENCIL NOTE SPACE

Insert Protection

Heavy 30 - gauge acetate construction gives 3 times the protective strength of any other method of insert packaging. **Individually-formed plastic pockets** to fit Adamas' wide range of square, triangular, and round throwaway inserts.

Operator Features

One-glance inventory— clear transparent plastic provides easy check of insert stock.

One-at-a-time dispensing by easy open slide.

Decimal equivalent chart and ruler protected by a full 1/32" covering of clear plastic ensures clean, clear readability through the hardest of use.

Radii gauge for convenient and accurate spot checking of corner radii.

Reusable pencil note space with unique silicate surface finish provides an always-handy (and erasable) surface for those important job notes and sketches.

Test these features yourself . . . discover how they can add extra efficiency and operator convenience to your own production system.

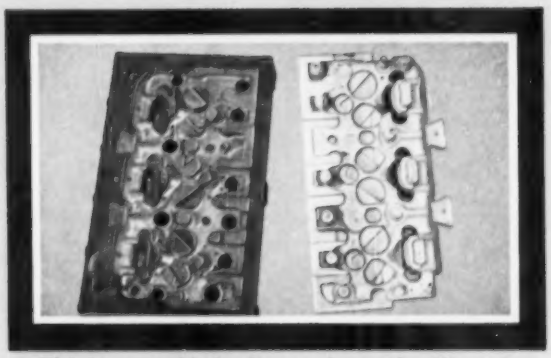
ADAMAS CARBIDE CORPORATION

KENILWORTH, NEW JERSEY

PRODUCERS OF TUNGSTEN CARBIDE TOOLS, TOOL TIPS, DIES, WEAR PARTS, DEX-A-TOOL AND CERALOX

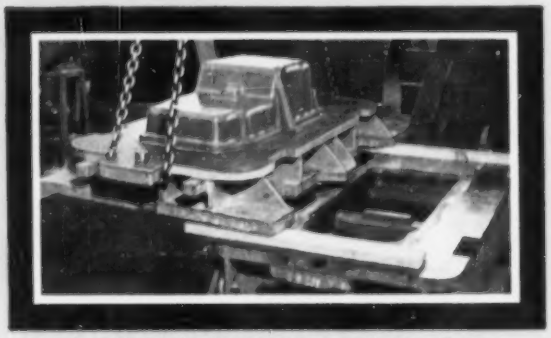
EPON® RESIN does it!

Speeds up International Harvester's Milwaukee Works' pattern modifications 65% ...cuts costs 50%!



Minimizes costs of design changes—International Harvester saved $2000 by making design modifications on an Epon resin model (right) of original drag jacket corebox (left).

Both model and mold are produced from an Epon resin-glass cloth laminate made for International Harvester's Milwaukee Works by Kish Industries, Inc., Lansing, Michigan.



Epon Resin simplifies pattern production—Epon resin faced cope and drag patterns for an IH engine can be drawn from molds with little danger of sticking.

Here's how:

At INTERNATIONAL HARVESTER CO., world-famous manufacturers of farm equipment, Epon resins have created a money-saving revolution in foundry pattern modification.

For example: to enlarge the cross section of a frame casting for an IH crawler tractor, a pattern change would normally require 3 weeks and cost $700. *But by applying Epon resin . . . costs dropped to $300 . . . and the pattern was back in production in 1 week!*

In another situation, the use of Epon resin to make a plastic core model of a new drag jacket corebox from the old one saved IH over $2000.

In many fields of industry, the Epon resins are making such savings possible because they have ideal properties for tooling applications:

- Exceptional dimensional stability . . . high impact strength . . . excellent resistance to abrasion . . . minimum residual stress in cured parts.
- Ease and speed of preparation.
- Low shrinkage in filled formulations, assuring perfect master reproductions; minimum warping and stresses.
- Adaptability to repairs and design changes.
- Minimum finishing requirements for smooth surfaces.

Can Epon resin tools and dies make comparable improvements and savings in *your* operations? Find out now by writing your tooling resin formulator.

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL

Now! A Complete Line of Self-Locking Microsize UNBRAKO Socket Cap and Set Screws

Nos. 0, 1, 2 and 3 in alloy steel and stainless steel are available with the Nylok* feature

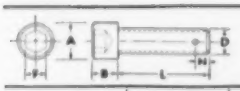
You effect major economies in time and money when you design and assemble small devices with self-locking microsize UNBRAKO socket screws. These close tolerance screws won't work loose. They simplify standardization of small devices where maximum reduction of weight is required without sacrifice of strength. They eliminate the necessity of designing costly special screws to fasten tiny parts in compact assemblies and they prevent the waste of production time while waiting for delivery of special screws.

In addition to having the overall advantages of microsize UNBRAKO socket screws, these screws can be used in holes tapped in soft or die cast materials without stripping threads and ruining expensive work. Also the set screws can be used with hardened shafts, since they lock against the threads of the tapped hole.

All UNBRAKO socket screws can be supplied with the self-locking Nylok feature. The UNBRAKO with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Seated or not, the screw locks positively wherever wrenching stops, won't work loose—because the tough resilient nylon pellet forces mating threads together.

Ask your authorized industrial distributor for details today. He carries complete stocks of self-locking UNBRAKO socket screws (caps and sets from #0 through 1 in., button heads #4 through ⅜ in., flat heads from #4 through ¼ in.). Or write us for literature and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 37, Pa.

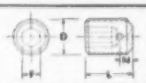
*T.M. Reg. U.S. Pat. Off., The Nylok Corporation



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO Socket Cap Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0	A .104	—	80	1/8	—	.047	5.5	14.0*	7.0*
	B .060	—	80	3/16	—	.047	5.5	14.0*	7.0*
	D .060	—	80	1/4	—	.047	5.5	14.0*	7.0*
	F .050	—	80	3/8	—	.047	5.5	14.0*	7.0*
#1	A .118	—	72	1/8	—	.047	11.0	28.0*	14.0*
	B .073	—	72	3/16	—	.047	11.0	28.0*	14.0*
	D .073	—	72	1/4	—	.047	11.0	28.0*	14.0*
	F .050	—	72	3/8	—	.047	11.0	28.0*	14.0*
#2	A .140	56	—	3/16	.063	—	24.0	3.0	1.5
	B .086	56	—	1/4	.063	—	24.0	3.0	1.5
	D .086	56	—	3/8	.063	—	24.0	3.0	1.5
	F 1/8	56	—	1/2	.063	—	24.0	3.0	1.5
#3	A .161	48	—	3/16	.063	—	40.0	6.5	3.0
	B .099	48	—	1/4	.063	—	40.0	6.5	3.0
	D .099	48	—	3/8	.063	—	40.0	6.5	3.0
	F 5/64	48	—	1/2	.063	—	40.0	6.5	3.0

*Measured in in.-gm. (those not marked with a star are measured in in.-oz.)



HEAT-TREATED ALLOY STEEL
Self-Locking Microsize UNBRAKO Socket Set Screws
Class 3A Threads

Screw Size		Threads per in. NC	Threads per in. NF	L Over-all Length	N Pellet Location NC	N Pellet Location NF	Torque Max. prev. on	Torque 1st off stat. min.	Torque 5th off stat. min.
#0		—	80	3/32	—	.047	5.5	14.0*	7.0*
	D .060	—	80	1/8	—	.047	5.5	14.0*	7.0*
	F .028	—	80	5/32	—	.047	5.5	14.0*	7.0*
		—	80	3/16	—	.047	5.5	14.0*	7.0*
		—	80	1/4	—	.047	5.5	14.0*	7.0*
#1		—	72	1/8	—	.062	11.0	28.0*	14.0*
	D .073	—	72	5/32	—	.062	11.0	28.0*	14.0*
	F .035	—	72	3/16	—	.062	11.0	28.0*	14.0*
		—	72	1/4	—	.062	11.0	28.0*	14.0*
#2		56	—	1/8	.062	—	24.0	3.0	1.5
	D .086	56	—	5/32	.062	—	24.0	3.0	1.5
	F .035	56	—	3/16	.062	—	24.0	3.0	1.5
		56	—	1/4	.062	—	24.0	3.0	1.5
#3		48	—	5/32	.093	—	40.0	6.5	3.0
	D .099	48	—	3/16	.093	—	40.0	6.5	3.0
	F .050	48	—	1/4	.093	—	40.0	6.5	3.0

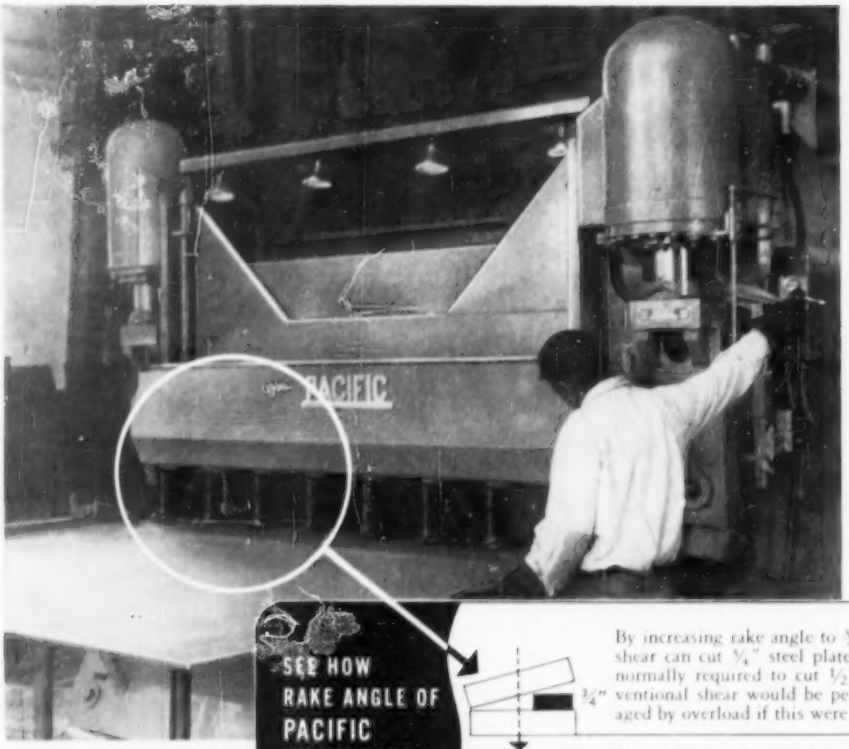
*Measured in in.-gm. (those not marked with a star are measured in in.-oz.)

Self-locking microsize UNBRAKO socket cap and set screws are available in sizes #0 through #3, in heat treated alloy steel (plated or unplated) and stainless steel, at your authorized industrial distributor. He also carries a complete stock of other self-locking UNBRAKO socket screws.

We also manufacture precision titanium fasteners. Write for free booklet.

sps **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co., Inc. • Cooper Precision Products • Standco Canada Ltd. Unbrako Socket Screw Co., Ltd.

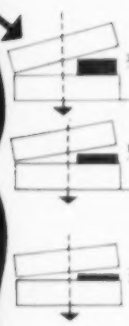


Adjusting Pacific rake angle by hand control lever

NOW...

a ½" shear adjustable to cut full length ¾" plate continuously*

SEE HOW RAKE ANGLE OF PACIFIC HYDRAULIC SHEAR IS CHANGED FOR PERFECT SHEARING OF ANY THICKNESS OF METAL



By increasing rake angle to ¾" per foot the shear can cut ¾" steel plate with the force normally required to cut ½" plate. A conventional shear would be permanently damaged by overload if this were attempted.

In cutting rated capacity (½"), shear cuts exactly the same as conventional fixed rake angle shear.

In cutting 3/16" steel, the rake angle is reduced to 3/32" per foot and the shear will cut strips 24" long up to 60 per minute with less twist and bow than with any conventional shear.

ABOVE, RIGHT: *¼" plate cut with Pacific adjustable rake shear*

ABOVE, LEFT: *¼" plate cut with conventional shear*

Rugged Pacific Hydraulic Shear cuts steel from 20 gauge to ¾" plate with optimum knife clearance. The knife clearance can be adjusted in 30 seconds to match plate thickness. Pacific Hydraulic Shear cuts noiselessly without shock. Knives last 2 to 3 times longer . . . maintenance downtime from blade changing is greatly reduced. Pacific Hydraulic is the safest shear. The ram, controlled by a portable foot pedal, can be stopped instantly at any point throughout the stroke in an emergency. Pacific Hydraulic cannot be damaged by overload. Independent time studies confirm that it will equal or out-produce any mechanical shear.

* with optimum knife clearance.

PACIFIC HYDRAULIC SHEAR

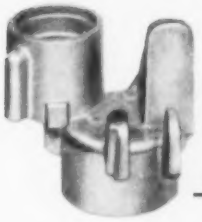
Mfg. by
PACIFIC INDUSTRIAL MFG. CO.
848 49th Ave., Oakland, Calif.
Plants: Oakland, Calif. and Mt. Carmel, Ill.

DISTRIBUTORS:
LOS ANGELES—Tornquist Machinery Co. • PORTLAND—Portland Machinery Co. • SEATTLE—Buckner Weatherby Co. • SALT LAKE CITY—Todd Machinery Co. • DENVER—Richard Ives & Co. • HOUSTON—Butcher, Carter & Preston Co. • DALLAS—Machine Tool Associates • TULSA—Martin Machinery Co. • KANSAS CITY, DES MOINES & ST. LOUIS—Moehlenpah Engr. Co. • NEW ORLEANS—Dixie Mill Supply Co. • NORFOLK—Tidewater Supply Co. • PHILADELPHIA, BALTIMORE—Calco Machinery Co. • NEWARK—G. M. Pearse & Co. • PITTSBURGH—Steel City Tool & Machinery Co. • BOSTON—Wigglesworth Machinery Co. • ROCHESTER—Macaulay Machinery Co. • CLEVELAND—Wigglesworth Machinery Distributors • INDIANA—Harry B. Green Machinery Co. • CHICAGO, MILWAUKEE—The Gute Co. • DETROIT—Taylor-Thompson Machinery Co. • MINNEAPOLIS—The Gute Co. • LOUISVILLE—Harry B. Green Machinery Co. • ALBUQUERQUE—Richard Ives & Co. • CANADA—Williams & Wilson Ltd.

Both machines shown below have six-station arrangements. The upper one has a 2-spindle feed-in milling unit and the lower one has an added outboard drilling unit. The rest of the standard units drive drilling, counterboring, and reaming spindles.

MACHINES NO. 1242 and 1243

REHNBERG-JACOBSON



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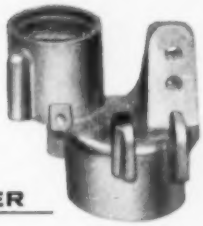

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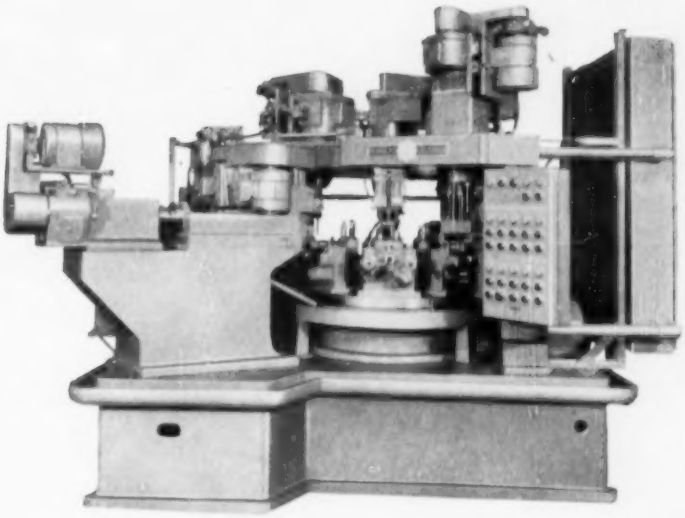
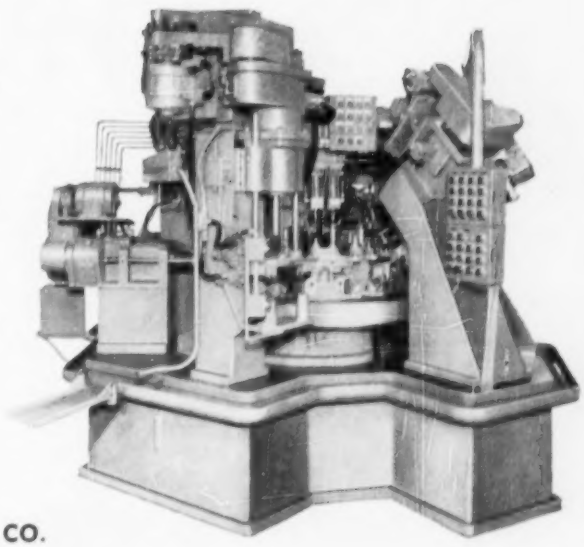


It was kind of tough to figure but we finally got it made...

The aluminum alloy die casting shown above, which is the servo unit housing for an automobile transmission, required machining that posed a few problems. Holes had to be drilled and reamed from both top and bottom, one side, and several odd angles. Two mounting surfaces had to be milled. Close limits were specified in several places, and the piece was awkward to clamp in a fixture. A complex single machine might have done the job, but we finally settled on two much simpler machines and wound up with good results. Hydraulic clamping is used and the part is turned one end up on the first machine and the other end up on the second machine. Flats milled in the first step are used for locating in the second. Four angular holes open the by-passes into the cylinders; three of these were easy, but we finally had to put the fourth on a little outboard unit on the second machine (just to the left of the operator's position). All drill units and index tables are standard R-J products, fitted onto a sturdy structure and equipped with specially designed heads, tooling, and fixtures. *Can we do something like this for you?*



REHNBERG-JACOBSON MANUFACTURING CO.
2135 KISHWAUKEE ST., ROCKFORD, ILLINOIS

DESIGNING ENGINEERS, MANUFACTURERS,
AND PRODUCTION CONSULTANTS

Whether you are tooling for short or long-run parts

Hi-Den can roll back forming costs

Above: Hi-Den die which has been band-sawed to rough shape, being hand-finished with woodworking tools to required accuracy. Use of Hi-Den can reduce die fabrication and forming costs 50%.

In aircraft and other light metal industries — wherever tooling cost is an important operational consideration — HI-DEN has effected phenomenal savings. Forming, stretch, draw and press-brake dies, Yoder rolls, jigs, fixtures and pressure pads are but a few of the more than 100 successful applications of HI-DEN.

HI-DEN is a laminate of wood veneers impregnated with phenolic resin and compressed under extreme heat and pressure to approximately half its original thickness. The resultant composition — only 1/6 as heavy as steel — is about three times as strong as equal weight of steel yet is easily shaped with standard tungsten carbide tools.

It has high dimensional stability and is virtually impervious to oil and moisture. Used in forming tools, HI-DEN's low coefficient of friction eliminates scratching and burring. HI-DEN treats the metal better and results in far lower scrap.

Our Technical Bulletin and literature show how to get increased production of superior quality products — at lower cost — with HI-DEN. Send for it today.

P.S. HI-DEN'S companion product, Parkwood 8000 (a kraft paper impregnated laminate) is widely used for cutting templates and bench tops. Smooth, hard, but resilient, it won't burr and scratch assemblies of aluminum alloys and other softer metals.

Parkwood Laminates, INC.

32 Water St., Wakefield, Massachusetts

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SAWS for the PRICE of

. . . use the WELLS 49A for Horizontal Cut-off and Vertical Band Sawing

The Wells 49A is a dual-purpose machine designed for shop or "job-site" work. As a horizontal cut-off saw, the 49A has a capacity of 3½" x 6". Swing the head to vertical position . . . it's an upright band saw. No tools required! Use it for cutting angles, slots, notches, bevels and light contour work.

The 49A can save time and money for you. Let your local Wells Distributor show you how . . . or write direct for complete information.

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
600 Service Road, Three Rivers, Mich.

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1957

the tool engineer

Annual Index of Technical Articles

Volume XXXVIII and XXXIX

This annual index for the past twelve issues lists subjects treated in Technical Section as well as the Foreign Abstracts and Technical Digests departments. It is divided into two parts. The first is an alphabetical author's index listing article titles. The second part is a subject listing. It is cross indexed for easy reference. Short items less than one page in length are indicated by an asterisk. Important subtopics are indexed along with major subjects. In this manner all references to a desired subject may be located.

nineteen—fifty seven

—A—

Adams, F. A.—Dual-Purpose Die*, May p. 79
Allen, J. F.—Experimenting with Ceramic Applications, Mar. p. 95
Alsobrook, B. R.—High-Strength Weldments for Aircraft, Dec. p. 196
Andrews, Raymond O.—Overcoming Indicator Point Wear, Apr. p. 77
Anshen, M.—Development of Engineering Managers*, Sept. p. 220
Appleton, Clifford T.—Thread Rolling, May p. 87

—B—

Baima, Peter J.—Planned Approach Cuts Manufacturing Costs, July p. 87
Battle, E. W.—Cutting Material and Machining Costs with Power Roll Forming, Nov. p. 107
Begley, R. T.—Molybdenum for Aircraft Applications*, Nov. p. 212
Bergman, J. W.—Power Roll Forming, Mar. p. 99
Bertossa, Robert C.—Developing Metals for the Future*, Nov. p. 221
Bethke, Albert—Intermittent Cuts Generate Lead, Jan. p. 90
Black, T. W.—Automation in Europe, Sept. p. 73
Fundamentals of Barrel Finishing, Equipment and Methods, Apr. p. 109
Fundamentals of Barrel Finishing, Planning, May p. 113
Modular Construction Cuts Design and Fabrication Costs, Oct. p. 119
Tooling for the Satellite, Mar. p. 83
Trends in Tool Engineering, Mar. p. 73
Ultrasonic Welding, Dec. p. 111
Bockrath, Joseph H.—Heat Treating an Important Step in Punch and Die Manufacture, Dec. p. 96
Bogart, Frank L. and Thomas Mitchell—Plastic Draw Dies, June p. 87
Bossman, Cliff—Retractable Locator for Stamping Dies*, Sept. p. 79
Bower, C. T.—Automatic Indexing Fixture*, Mar. p. 82
Bright, James R.—Role of Materials Handling in Automatic Production* Sept. p. 218
Brown, Clement F.—Centering Plug for Beveling Pipe*, Jan. p. 79

—C—

Caddell, Robert M. and Karl H. Moltrecht—How To Determine Production Tolerances, Complete Interchangeability, Oct. p. 81
How To Determine Production Tolerances, Statistical Methods and Selective Assembly, Nov. p. 85
Cain, Victor—Tapping Tool*, June p. 79
Castracane, N. B. and N. G. McRae—Mechanically Tabulating and Analyzing Die Performance Records, Oct. p. 102
Chace, Frank D.—Locating Device for Lathe Boring*, Mar. p. 80
Chiesorin, Pietro—Measuring Cutting Forces, Dec. p. 114
Cole, A. N.—Realistic Depreciation Policies are Vital to Survival, Sept. p. 81
Conway, Perry—Machining Openings in Die Block*, Apr. p. 76
Cook, Lawrence H.—How To Reduce Diamond Wear, Dec. p. 108
Critchfield, Robert N.—Engineers in Manufacturing, Dec. p. 199
Cross, Ralph E.—A Machine Tool Builder Looks at Numerical Control, Nov. p. 211
Curtis, Michael—Effective Control Means Fewer Tools and Gages, Jan. p. 104

—D—

Dahl, Hjalmar—Triple-Action Drawing Die*, Aug. p. 78
Daly, Robert—Multipurpose Fixture, Oct. p. 78
Delmonte, John—Controlling Physical Properties of Plastics, June p. 89
Quality Control for Plastic Tools, Oct. p. 99
Dickinson, Thomas A.—Automation for Standard Lathe*, Nov. p. 82
Dodd, J.—Clamp*, Dec. p. 80
Douglas, Millard T. and Leo T. Parker—Mechanically Clamped vs. Brazed Carbides, Apr. p. 85
Douglas, Robert B.—Cavalcade of Tools, Mar. p. 117
Doyen, Patrick S.—How To Weld Tool Steels*, Sept. p. 222
Du Paul, Alfred—Removing Broken Drill Points*, Jan. p. 78

—E—

Ellis, John L.—Carbides That Are Weldable, Machinable and Heat Treatable, Apr. p. 103
Emery, Alfred H.—Dial Indicators Simplify Inspection Problems, Nov. p. 111
Ensrud, Alf Fridtjof—Steel Alloys for Supersonic Aircraft, Dec. p. 194
Enyedy, Ralph—Planning Barrel Finishing Operations, Dec. p. 105
Eshelman, Ralph H.—Engineering and Tooling Emphasize Speed, Quality and Dependability, Mar. p. 125
Make or Buy with Operations Research, July p. 73
Everse, H. M.—Fire-Resistant Hydraulic Fluids Mean Safer Die Casting, Oct. p. 113
Ewing, Wayne—Bulge Forming with Expanding Mandrel Machines, Sept. p. 105

—F—

Fanning, C. L.—Engineered Training Programs Pay Off, Aug. p. 71
Fitzgerald, Glen R.—Trends in Production, Oct. p. 207
Fleury, Richard B. and Leonard McDermott—Redesign Simplifies Processing of Machine Base, July p. 113
Frommelt, Horace—How To Mill with Carbides on Older Machines, Mar. p. 122

—G—

Gaither, H. Rowman, Jr.—Engineering a Better Future*, Oct. p. 211
Garrett, John H.—Castings for Aircraft, Dec. p. xx
Gerber, H. J.—Precision Expanding Stub Mandrel, Feb. p. 83
Spacing Holes on a Helix*, Jan. p. 80
Toolmaker's Locating Jig, Sept. p. 80
Gorecki, Stefan—Research Dynamometer Records Torque at Every Angular Position, Oct. p. 107
Grant, Nicholas J. and Philip Manganaro—Ceramic Investment Shells Give High Quality Castings, Feb. p. 109
Greenberger, Martin H.—Machinery Replacement Decisions—Developing and Using Formulas, July p. 95
Gustin, E. K., A. O. Mooney and A. S. Love—Cutting Packaging and Handling Costs*, Sept. p. 215

—H—

Haene, Alfred O. and Robert T. Hock—Applying Ceramics to Production, May p. 100
Halstad, Lawrence R.—Trends in Quality Control*, Nov. p. 217
Hardman, Porter—How To Reduce Chatter During Shaving, June p. 92
Henriksen, Erik K.—Hidden Troublemakers, Residual Machining Stresses, Apr. p. 92
Heyer, Norbert A.—Sintered Inserts for Plastic Molds*, Sept. p. 79
Hiatt, H. D.—Grinding Spherical Ball Seats*, Dec. p. 79
Hird, Arthur F.—Design and Drafting Standards for Jigs and Fixtures, Nov. p. 123
Hoch, A. D., M. C. Shaw and T. R. Reinhart—How To Use Ceramics on Today's Machine Tools, Sept. p. 109
Hock, Robert T. and Alfred O. Haene—Applying Ceramics to Production, May p. 100
Houle, James A.—How To Produce More Ideas, Apr. p. 71

—I—

Iddles, Alfred—Effective Utilization of Engineers, Dec. p. 193
Isetts, Roger—Funnel for Directing Coolant Flow*, Jan. p. 80

—J—

Joecken, C. V.—Hydraulic Cylinder Production Tooling, Aug. p. 101
Johnson, Allen M.—Calculating Compound Angles, Sept. p. 127
Converting Tolerances to Orthographic Form, May p. 121
Formulas for Tools that Face Past Center, Dec. p. 121
Work Holder for Studs*, Dec. p. 80
Johnson, S. J. and Varnum, E. C.—Exact Method for Computing Over-Pin Measurements for Helical Forms, June p. 116
Jones, Ernest—Coolant Unit*, May p. 77
Drill Feed for Lathes*, Mar. p. 81
Magnetic Angle Plate*, June p. 78
Juran, J. M.—Industrial Engineers and Quality Control*, Oct. p. 210

—K—

Kanes, Murray and C. B. Sung—How To Use Tape Controlled Machining, Aug. p. 83
Keegan, G. E.—Supervisory Development Programs, The Practical Approach to Better Management, Dec. p. 73
Kendall, George H., Sr.—How To Plan for Automatic Assembly, Feb. p. 96
Kendall, George H., Jr.—Flexible Thinking Creates Critical Tooling, Sept. p. 88
Kleiber, Henry—How To Control Gaging Costs, Aug. p. 79
Kopeck, Joseph C.—Hinge Production, Progressive Dies Cut Stamping and Assembly Costs, Feb. p. 99
Kopelman, Bernard—Metals for the Atomic Age*, Sept. p. 223
Koslow, Henry—Parallels for Lathe Chucks*, Apr. p. 76
Punch Aligning Tool*, May p. 78
Size Identification of Drills*, June p. 80
Kramer, Leonard, Charles J. Marsel and Alexander Saunders—Engineering Properties of Pattern Waxes, Nov. p. 95
Kronenberg, Max—Constant Cutting Speed Facing, Dec. p. 93
Krueger, Paul L.—Low-Cost Die, Oct. p. 77

—L—

Lascoe, Orville D.—Shrink Tests Developed for Tool Plastic, Nov. p. 117
Laus, L. E., and Adolph Vicek, Jr.—Manufacturing Research, A Plan for the Future, Nov. p. 75
Lewis, Jack—Putting Honeycomb Scrap to Work, Dec. p. 91
Linnert, George E.—New Stainless for High-Temp Uses*, Oct. p. 212
Love, A. S., A. O. Mooney and E. K. Gustin—Cutting Packaging and Handling Costs*, Sept. p. 215
Lundby, E. and W. Wollering—Welded Structures Improved by Forging*, Nov. p. 216

—Mc—

McDermott, Leonard and Richard B. Fleury—Redesign Simplifies Processing of Machine Base, July p. 113
McEwan, William G.—Pull Reaming Prevents Runout Problems, Sept. p. 91
McKinsey, Woerner, Jr. and John P. Moran—Applications of Vibratory Hopper Feeders, May p. 80

*Brief article less than 1 page.

AUTHOR INDEX

McLaughlin, Clint—Corner-Trimming Die*, May p. 78
Feed Screw Cleaner*, June p. 79
Height Setting Gage*, Nov. p. 83
Milling Template*, Apr. p. 75
Punch Grinding Template*, Jan. p. 78
McRae, N. G. and N. B. Castracane—Mechanically Tabulating and Analyzing Die Performance Records, Oct. p. 102

—M—

MacCutcheon, Richard H.—Patent or Secrecy for Shop Tools and Processes, Jan. p. 94
Maginniss, F. J., W. J. Martiny and D. H. Ware—How Computers Save Engineering Time*, Sept. p. 216
Malaker, S. F.—Atomic Instruments for Industry*, Sept. p. 221
Mangianaro, Philip and Nicholas J. Grant—Ceramic Investment Shells Give High Quality Castings, Feb. p. 109
Marble, J. D. and C. V. Ruehrwein—Barrel Finishing Operation Improves Fatigue Strength of Jet Engine Parts, Nov. p. 99
Marchak, Nicholas—Automation for Small Manufacturers*, Nov. p. 219
Marsel, Charles J., Leonard Kramer and Alexander Saunders—Engineering Properties of Pattern Waxes, Nov. p. 95
Martin, George J.—Maintenance Operations for the Plant of the Future, Dec. p. 195
Martiny, W. J., D. H. Ware and F. J. Maginniss—How Computers Save Engineering Time*, Sept. p. 216
Meloling, H. E.—Making Rubber Ring Gaskets*, May p. 79
Meno, S. J.—Homemade Cutting Tools, Dec. p. 109
Meyer, Wm. E.—Fixture for Milling Elongated Slots, Dec. p. 78
Minser, Richard—Improvised Indicating Gage*, Nov. p. 84
Mitchell, Thomas and Frank L. Bogart—Plastic Draw Dies, June p. 87
Moltrecht, Karl H. and Robert M. Caddell—How to Determine Production Tolerances, Complete Interchangeability, Oct. p. 81
How To Determine Production Tolerances, Statistical Methods and Selective Assembly, Nov. p. 85
Mooney, A. O., E. K. Gustin and A. S. Love—Cutting Packaging and Handling Costs*, Sept. p. 215
Mooney, Clyde—How To Plan for Low-Cost Production, Jan. p. 73
Moran, John P. and Woerner McKinsey, Jr.—Application of Hopper Feeders, May p. 80
Moritz, J. M. and H. L. Stewart—Hydraulics for the Tool Engineer, Dec. p. 81
Murphy, Glenn—Nuclear Engineers Needed*, Oct. p. 211

—N—

Nahm, William H.—How To Predict Machine Capability, Jan. p. 87
Nelson, Ragner—Adjustable Grooving Tool*, Nov. p. 80
Neville, O. Kenton—Nuclear Techniques for Study of Surface Coatings*, Nov. p. 220
Nietsch, H. Erich—Mounting Production Machine To Control Vibration and Simplify Repositioning, July p. 105
Nittel, Karl W.—Quick-Change Brush Head*, July p. 81
Novack, Edward J. and Robert Tirrell—Profile Turning with Positive Rake Inserts, Feb. p. 114

—O—

Olson, O. A.—Drill Jig for Small Holes*, Dec. p. 79

—P—

Pall, Chester—Making Wire Parts on Drill Press*, Aug. p. 76
Page, G. R.—Gage for Groove Diameters*, July p. 79
Parker, Leo T. and Millard T. Douglas—Mechanically Clamped vs Brazed Carbides, Apr. p. 85
Parker, R. R., C. F. Wallace and R. J. Wendell—Vacuum Chucking Speeds Production, Aug. p. 98
Peerman, D. E. and W. Robert Price—Polyamide Resin Alloys and Tooling Applications, May p. 96
Pessl, Hubert J.—Improved Cold Extrusion Sequence, May p. 109
Peters, R. W.—Impact and High-Velocity Forming, July p. 83
Pinsky, Jerome D.—Spot-Welding Machine Improves Productivity, June p. 103
Preator, Frederick—Preparing for a Tool Engineering Career, June p. 83
Price, W. Robert and D. E. Peerman—Polyamide Resin Alloys and Tooling Applications, May p. 96

—R—

Pachwal, John F.—Milling Internal Cams*, July p. 80
Reinhart, T. R., M. C. Shaw and A. D. Hoch—How To Use Ceramics on Today's Machine Tools, Sept. p. 109
Rettaliata, John T.—Need for Basic Research, Dec. p. 198
Ridgway, W. F.—How To Apply Special Machine Tools, May p. 73
Ritchey, John A.—Developing Engineers for Manufacturing Management, Oct. p. 73
Rohrer, James W.—A Psychologist Looks at Supervision*, Nov. p. 215
Rosh, F. W.—Fixture Permits Simultaneous Operations, Sept. p. 100
Ruehrwein, C. V. and J. D. Marble—Barrel Finishing Operation Improves Fatigue Strength of Jet Engine Parts, Nov. p. 99
Rush, Frank L.—Collet Heat-Treating*, June p. 81
Jig for Grinding Shear Blade Edges*, Feb. p. 84
Work-Holding Fixture*, July p. 82
Rushing, Raymond G.—Will Automation Pay, June p. 109

—S—

Saunders, Alexander, Charles J. Marsel and Leonard Kramer—Engineering Properties of Pattern Waxes, Nov. p. 95
Schaller, Leo and John Simmons—Abrasive-Belt Grinding—Fixtures Speed Production and Cut Costs, Sept. p. 120
Scharff, S. E.—Determining Costs of Machine Replacement, June p. 73
Schlesinger, Klaus E.—Spring-Loaded Grinding Center*, Nov. p. 81
Schwartz, Herbert—Ceramic Jig Speeds Induction Brazing, July p. 119
Schweisheimer, W.—Good Illumination Improves Plant Efficiency, Nov. p. 115
Preventing Skin Troubles in the Shop, Sept. p. 87
Shaw, M. C. and P. A. Smith—Tests Compare Finishes from Ceramic and Carbide Tools, Apr. p. 97
Shaw, M. C., A. D. Hoch and T. R. Reinhart—How To Use Ceramics on Today's Machine Tools, Sept. p. 109
Siekman, H. J.—Bonding Ceramic Tool Tips to Steel Shanks, July p. 101
Simmons, John and Leo Schaller—Abrasive-Belt Grinding—Fixtures Speed Production and Cut Costs, Sept. p. 120
Sjostedt, William E.—Cold Rolling Tool*, July p. 80
Small, Douglas M.—Holding Parts with Tape*, Nov. p. 83
Smith, P. A. and M. C. Shaw—Tests Compare Finishes from Ceramic and Carbide Tools, Apr. p. 97
Snyder, Norman F.—Alignment Test Mandrel*, Aug. p. 76
Spindle Drill Drift Key*, Nov. p. 81
Sokol, Benjamin—How To Repair and Modify Plastic Tools, Mar. p. 86
Sperman, J. H.—Camera Aids Small Lot Tooling, June p. 101
Spicer, Charles—Spline Forming Die*, Feb. p. 84
Sprigings, William J.—Cold Forming Improves Tubular Parts, July p. 116
Stallman, R. F.—Cutoff Tool for Tubing*, July p. 79
Stewart, H. L. and J. M. Moritz—Hydraulics for the Tool Engineer, Dec. p. 81
Stier, Henry W.—Experience with the Kolesov Tool, Jan. p. 97
Stonitsch, John—How Flat Is Flat, Nov. p. 114
Strasser, Federico—Drilling-Reaming Jig*, June p. 80
Multiple Die Construction*, June p. 82
Staking Tool*, Nov. p. 84
Strong, Jack E.—Mechanical Clamp Speeds Production, Feb. p. 107
Sullivan, Buckley—Flash Trimming Dial Feed*, Mar. p. 80
Forming Die*, June p. 81
Sung, C. B. and Murray Kanes—How To Use Tape Controlled Machining, Aug. p. 83
Sweet, Donald E.—Gaging Hole Tolerances, Sept. p. 78

—T—

Tandler, W. S.—Automatic Gaging by Tape Control, Sept. p. 213
Tirrell, Robert and Edward J. Novack—Profile Turning with Positive Rake Inserts, Feb. p. 114
Topelian, Paul—Tool Life Extended by Hard-Chrome Plate, Oct. p. 116

—U—

Urbach, Harley—To Relieve Engineering Shortage, Train Company Employees, Feb. p. 77

—V—

van der Burgt, J. H.—Four Slide Press or Progressive Die, Jan. p. 81
Varnum, Edward C.—Inspecting Involute Helicoid Forms with Available Pins, Sept. p. 95
Varnum, Edward C. and S. J. Johnson—Exact Method for Computing Over-Pin Measurements for Helical Forms, June p. 116
Vicek, Adolph, Jr. and L. E. Laux—Manufacturing Research, A Plan for the Future, Nov. p. 75

—W—

Wagner, R. A.—Axiomatic System Simplifies Assembly Tooling, Apr. p. 78
Wallace, C. F., R. R. Parker and R. J. Wendell—Vacuum Chucking Speeds Production, Aug. p. 98
Ware, D. H., W. J. Martiny and F. J. Maginniss—How Computers Save Engineering Time* Sept. p. 216
Wason, Robert A.—How To Machine Plastics, Cutting and Turning, Jan. p. 109
How to Machine Plastics, Secondary Operations, Feb. p. 117
Mechanized Production, Planning the Plant, Aug. p. 109
Wendell, R. J., R. R. Parker and C. F. Wallace—Vacuum Chucking Speeds Production, Aug. p. 98
Wennberg, Jens L.—Titanium Chips Can Be Broken Easily, Mar. p. 91
Williams, Lynn A.—Electrolytic Grinding Tames Hard Metals, Aug. p. 96
Williams, Tyler E.—Effective Engineering Management*, Nov. p. 214
Wilson, W. R.—Template Tooling for Short-Run Stamping, Oct. p. 205
Winter, T. H.—Combination Staking Punch and Lubricator*, Feb. p. 82
Wollering, W. and E. Lundby—Welded Structures Improved by Forging*, Nov. p. 216
Wood, William W.—Buckling Limits in Contour Forming, Feb. p. 85; Mar. p. 105
Woodman, E. E.—Extension for Beam Compass*, Feb. p. 82

—Z—

Zierk, Donald E.—Tool Engineering for Production of Miniature Parts, Oct. p. 86
Zore, John—Cutter Grinding Fixture*, June p. 82

*Brief article less than 1 page.

nineteen—fifty seven

—A—

Abrasive belt grinding, Sept. p. 120
Abrasive belts for metal finishing, Feb. p. 127
Abrasive wheel safety, Apr. p. 119
Accessories, built into screw machine*, June p. 96
Acrylics, machining of, Jan. p. 109
Acrilycs, secondary operations on, Feb. p. 117
Adjustable grooving tool*, Nov. p. 80
Administration, see also Management
Aircraft castings, Dec. p. 194
Aircraft, future developments in, Dec. p. 194
Aircraft production, contour forming of parts with special clamps, Feb. p. 107
Aircraft production, cutting costs in, July, p. 87
Aircraft tooling, axiomatic system, Apr. p. 78
Air gaging, Nov. p. 114
Air-powered coolant unit*, May p. 77
Air-powered wrenches*, June p. 108
Alloy, special for bending tool*, Aug. p. 93
Alloys, search for hardier*, Nov. p. 101
Aluminum honeycomb, Dec. p. 91
Analysis of grinding vibration*, May p. 205
Analyzing automatic machines*, Aug. p. 205
Analyzing die performance records, Oct. p. 102
Angle plate, magnetic*, June p. 78
Appliance industry, automation in*, Aug. p. 199
Applications, molybdenum for aircraft*, Nov. p. 212
Applications of special machine tools, May p. 73
Arabic automation, robot servant*, Aug. p. 82
Arbor for holding splined gear blanks, May p. 106
Arbor, holding workpiece*, Oct. p. 95
Arc welding*, Dec. p. 89
Arc welding, redesign of base, July p. 113
Arc welding, submerged*, Dec. p. 89
Argus uses OR for make-or-buy decisions, July p. 73
Assembly, air-powered wrenches, with*, June p. 108
  automation of, Feb. p. 215
  brazing steel parts*, Aug. p. 103
  connecting rods and caps, automatic, of*, June p. 94
  earth satellite, of, Mar. p. 83
  expanding copper tubes for refrigerants*, Aug. p. 105
  machine, spinning operations, Oct. p. 94
  presses, of*, July p. 112
  tooling for aircraft, requirements of, Apr. p. 78
  use of portable nut runners*, Aug. p. 108
Atomic age, metals*, Sept. p. 223
Atomic instruments for industry*, Sept. p. 221
Atomic tooling program, Sept. p. 88
Automatic assembly,
  can production, in*, Feb. p. 106
  connecting rods and caps, of*, June p. 94
  design of parts for*, July p. 195
  electronic units*, Feb. p. 106
  Europe, in, Sept. p. 73
  planning for, Feb. p. 96
  printed circuits*, Aug. p. 108
  torus vane loader*, Feb. p. 104
  valve springs, of, Feb. p. 105
  when to plan for, Feb. p. 215
Automatic control of cutting speeds*, June p. 205
Automatic equipment, testing of*, Aug. p. 205
Automatic gaging,
  automatic gaging, tape control, Sept. p. 213
  tape control, by, Sept. p. 213
Automatic grinding, carbide face mills*, May p. 108
Automatic indexing fixture for milling*, Mar. p. 82
Automatic operation, gear shaving set-up for cluster gears*, Aug. p. 92
Automatic production,
  lines, automotive*, Mar. p. 267
  materials handling*, Sept. p. 218
  small electric motors, Aug. p. 109
Automatic riveting, tape-controlled*, May p. 112
Automatic screw machine has built-in accessories*, June p. 96
Automatic screw machining, reducing chatter during shaving operation, June p. 92
Automatic screw machining, reducing chatter during shaving, June p. 92
Automatic size control, grinding operation*, Oct. p. 112
Automatic transfer machine*, Nov. p. 103
Automatic transfer machine for electric motor cranes*, June p. 106
Automatic vane loader*, Feb. p. 104
Automation,
  assembly, Feb. p. 96
  assembly of cans*, Feb. p. 106
  assembly of electronics circuits*, Feb. p. 106
  assembly operations, Feb. p. 215
  assembly of torus vanes*, Feb. p. 104
  assembly of valve springs*, Feb. p. 105
  automation, Sept. p. 73
  cold extrusion, piston pins, of*, Aug. p. 107
  design of parts for, July p. 193
  economic analysis of, June p. 109
  Europe, in, Sept. p. 73
  future trends in*, Mar. p. 267
  Germany, report of, in*, June p. 203
  hopper feeders for, May p. 80
  how to plan for*, Aug. p. 199
  jet blades shot peening, Nov. p. 122
  management, and, Jan. p. 205
  miniature parts, Oct. p. 86
  multispindle machine scalps pistons*, May p. 94
  numerical control lathe*, Mar. p. 114
  product engineer, and the*, Feb. p. 219
  robot from old Arabia*, Aug. p. 82
  small manufacturers, for*, Nov. p. 219
  small runs*, Dec. p. 88
  spot welding machine improves productivity and quality, June p. 103
  standard lathe, for*, Nov. p. 82
  tape-controlled machining, Aug. p. 83
  tape-controlled riveter*, May p. 112
  tool engineer's viewpoint, from*, Jan. p. 208
  transfer and feed methods*, Oct. p. 111
  transfer grinding of torque converter housing*, Mar. p. 103
  welding, shielded arc, of*, Mar. p. 116
Auxiliaries, turret press, Nov. p. 92
Axiomatic system of aircraft tooling, Apr. p. 78

—B—

Band sawing, of dies in articulated machine, July p. 90
Barrel finishing,
  barrel finishing, Dec. p. 105
  equipment and methods, Apr. p. 109
  fundamentals-planning, May p. 113
  operation, Nov. p. 99
  operation improves fatigue strength, Nov. p. 99
Basic research, Dec. p. 198
Beam compass, extension for*, Feb. p. 82
Bearing-race honing machine*, Sept. p. 99
Bearings, for machine tools*, Mar. p. 264
Belleville springs*, July p. 197
Belt finishing, Feb. p. 127
Bending process simplifies forming of wall tubing, July p. 116
Bent tubing, physical properties, Mar. p. 136
Beta-ray gaging in industry*, June p. 209
Beveling pipe, centering plug for*, Jan. p. 79
Blackboard, electrical*, Oct. p. 108
Blackboard, electrical, operations research*, Oct. p. 108
Blackboard, mechanical device aids engineers*, July p. 115
Blanking plastics, machining of, Jan. p. 109
Blast cleaning, European uses*, July p. 181
Bolsters make short runs practical*, Oct. p. 96
Bonding, Dec. p. 111
Bonding agents for ceramic tool tips, July p. 101
Bonding of ceramic tips of tools, May p. 100
Bore size, honed, Nov. p. 94
Boring,
  cylinders*, July p. 111
  milling large parts, and*, July p. 111
  operation, canned motor pump*, Jan. p. 100
Brakes and clutches, electromagnetic for computer*, May p. 95
Brazed tools, carbide, Apr. p. 85
Brazing,
  filler metals for, June p. 121
  induction type for assembly*, Aug. p. 103
  operation, centralized fluxing*, Feb. p. 116
  setup-semiautomatic*, Apr. p. 108
Broaching plastics, Feb. p. 117
Brushing operation, quick-change head for*, July p. 81
Building block automation, automotive industry*, Mar. p. 267
Building blocks, standardization of electronic circuits, June p. 99
Bulge forming, Sept. p. 105
Burnishing, barrel finishing, May p. 113
Burnishing tool*, Dec. p. 103
Burnishing tool carbide*, Dec. p. 103
Buttress thread cutting*, July p. 111

—C—

Calculating compound angles, Sept. p. 127
Calendar, tool engineers*, Mar. p. 121
Camera aids small-lot tooling, June p. 101
Cams, internal, milling out of*, July p. 80
Carbide,
  bits, cracks and stresses in*, Feb. p. 212
  burnishing tools*, Dec. p. 103
  button-tip toolholder for planing*, Jan. p. 101
  ceramic tool tests, and*, Mar. p. 270
  ceramic tools, finishes from, and, Apr. p. 97
  cutting tools, clamped vs. brazed, Apr. p. 85
  grinding electrolytically, Aug. p. 96
  indicator points*, Apr. p. 77
  tooling*, Nov. p. 102
  tooling, automatic chucking*, Dec. p. 101
  tools*, Dec. p. 102
  tools in machining plastics, Jan. p. 109
  tools, thread cutting with, abroad*, Jan. p. 201
Carbides,
  ceramics, vs. application on today's machine tools, Sept. p. 109
  faced with steel for tooling, Apr. p. 103
  new types, weldable, machinable and heat-treatable, Apr. p. 103
  training programs for, Aug. p. 71
  use on older milling machines, Mar. p. 122
Carbon steel vs. titanium machining, Mar. p. 91
Casting,
  advances in investment, Sept. p. 115
  investment type with ceramic shells, Feb. p. 109
  machines vertical*, Sept. p. 101
  materials, Oct. p. 124
  materials, heat and corrosion-resistant, Oct. p. 124
  shell molding type applications*, Apr. p. 224
Castings for aircraft, Dec. p. 194
Cavalcade of tools, Mar. p. 117
Centrifugal pump, canned type for radioactive materials*, July p. 92
Ceramic,
  carbide tool tests, and*, Mar. p. 270
  carbide tools, finishes from, and, Apr. p. 97
  cutting tool*, Aug. p. 104
  cutting tools, case studies at Cameron Iron Works, Mar. p. 95
  investment shells for precision casting, Feb. p. 109
  jig for induction brazing, July p. 119
  slugs and throw-away inserts for plastic tools, May p. 100
  tool bits, French experience*, Feb. p. 210
  tool makes fine cuts*, Jan. p. 102

*Brief article less than 1 page

SUBJECT INDEX

Ceramic tools,
bonding to steel shanks, July p. 101
feeds and speeds for, Mar. p. 133
production application of, May p. 100
Ceramics, how to use on today's machine tools, Sept. p. 109
Chatter, reduction during (shaving operations, automatic), June p. 92
Chatter in tools, Kolesov type, Jan. p. 97
Checking fixtures, Dec. p. 91
Checking measurements*, Dec. p. 100
Chip breakers for titanium and stainless, Mar. p. 91
Chip removal from fixtures, designed for*, Feb. p. 210
Chrome plate extends tool life, Oct. p. 116
Chuck jaws of polyamide epoxy resin, May p. 96
Circuitry, standardization of electronics, June p. 99
Cleaner for feed screws*, June p. 79
Cleaning, blast type, European*, July p. 181
Clutches and brakes, electromagnetic for computer*, May p. 95
Coatings, protective, silicone type*, Apr. p. 230
Cobalt bonded tungsten, Apr. p. 103
Cold extrusion, automatic setup for piston pins*, Aug. p. 107
Cold extrusion, improves sequence for, May p. 109
Cold formed production redesign improves tubular products, July p. 116
Cold forming, Nov. p. 107
Cold forming, extrusion sequence, May p. 109
Cold forming improves thin-walled parts, July p. 116
Cold reducing steel*, Nov. p. 113
Cold rolling, threads and small parts, May p. 87
Cold rolling tool*, July p. 80
Cold working, Nov. p. 107
Collet heat-treating*, June p. 81
Company employees, training for engineers, Feb. p. 77
Compass, beam, extension for*, Feb. p. 82
Compound angles, Sept. p. 127
Compound angles, calculating, Sept. p. 127
Computers*, Sept. p. 216
Computers cut manufacturing paper work*, Mar. p. 278
Computers save engineering time*, Sept. p. 216
Constant speed facing, Dec. p. 93
Construction, modular, Oct. p. 119
Continuous flow production*, Nov. p. 106
Contour,
forming, buckling limits in, Feb. p. 85; Mar. p. 105
forming, special mechanical clamp for, Feb. p. 107
machining, aircraft requirements*, Feb. p. 226
machining, future problems in aircraft industry*, Jan. p. 212
sawing with articulated machine, July p. 90
Control, numerical, Nov. p. 211
Control template for duplicate tool grinder*, June p. 98
Controlling gaging costs, Aug. p. 79
Controls, standardization of electronic circuits June p. 99
Controls, of tools and gages, Jan. p. 104
Controls, trends in quality*, Nov. p. 217
Conveyors in mechanized production, planning, Aug. p. 109
Coolant flow, funnel for directing*, Jan. p. 80
Coolant unit*, May p. 77
Cooling characteristics, wax, Nov. p. 95
Corner-trimming die*, May p. 78
Corrosion-resistant alloys, Oct. p. 124
Corrosion, prevention of*, Jan. p. 216
Cost,
reduction through abrasive belt grinding, Sept. p. 120
savings, Dec. p. 93
studies for manufacturing, Jan p. 73
study of automation, June p. 109
using special machine tools, of, May p. 73
Costs, reduction of manufacturing through planning, July p. 87
Crankpin grinder*, Oct. p. 98
Creativity, self-development of, Apr. p. 71
Critical tooling for atomic program, Sept. p. 88
Crush-roll grinding machine for gears, Feb. p. 93
Cutoff tool for tubing*, July p. 79
Cutter grinding fixture*, June p. 82
Cutters, Dec. p. 109
Cutters, face milling, carbide, Kolesov, Jan p. 97
Cutting conditions and residual stresses, Apr p. 92
Cutting edge temperature research*, Mar. p. 265
Cutting feeds and speeds for titanium, Mar p. 91
Cutting fluids and residual stresses, Apr. p. 92
Cutting forces, Dec. p. 114
Cutting forces measuring, Dec. p. 114
Cutting forces in surface grinding*, Apr. p. 215, May p. 203
Cutting material and machining costs with power roll forming, Nov. p. 107
Cutting oils*, Sept. p. 87
Cutting operation with torches*, July p. 109
Cutting plastics, Jan. p. 109
Cutting speed, Dec. p. 93
Cutting speeds controlled automatically*, June p. 205
Cutting tools,
bonding ceramic tool tips, July p. 101
carbides, training programs for, Aug p. 71
ceramic*, Aug. p. 104
ceramic and carbide tests*, Mar. p. 270
ceramic, case studies of, Mar. p. 95
ceramics vs. carbides on today's machine tools, Sept. p. 109
cutting tools, Dec. p. 109
finishes from ceramic and carbide, Apr p. 97
protected by hard chrome plate, Oct p. 116

—D—

Damping chatter in shaving operations, automatics, June p. 92
Data processing*, Sept. p. 90
DC drive for box-making machine, Feb. p. 95
Deburring, barrel finishing, May p. 113
Depreciation of machine tools, determining, June p. 73
Dermatitis, Sept. p. 87
Descaling, barrel finishing, May p. 113
Design for automation*, Feb. p. 219
Design of machine tools, review of*, Mar. p. 265
Design, modular construction cuts costs, Oct p. 119
Design, preliminary procedures for low-cost production, Jan. p. 73
Designing parts for automation, July p. 193
Developing engineers for manufacturing management, Oct. p. 73
Developing metals*, Nov. p. 221
Developing metals for the future*, Nov. p. 221
Development of engineering managers*, Sept. p. 220
Development programs, for manufacturing management, Oct. p. 73
Developments in tooling of techniques and materials, Apr. p. 219
Device, locating for lathe boring*, Mar. p. 80
Dial-feed spot-welding machine increases productivity, June p. 103
Dial indicators, Nov. p. 111
Diamond,
grinding of carbide, for Kolesov tool, Jan. p. 97
powder grinding wheels*, June p. 102
tool for superfinish*, Jan. p. 102
Diamonds, orientation as wheel dressers, Dec p. 108
Die alloy reduces tooling costs*, May p. 217
Die casting, fire-resistant hydraulic fluids, Oct p. 113
Die casting, trimming*, Mar. p. 80
Die, construction of multiple type*, June p. 82
Die, corner-trimming*, May p. 78
Die cushions improve parts*, Oct. p. 95
Die design,
dual-purpose*, May p. 79
form type for multiple forming*, June p. 81
spline forming*, Feb. p. 84
tool steels, applications of, July p. 121
Diemaking in band saw, July p. 90
Diemaking, machining openings*, Apr. p. 76
Die performance records, Oct. p. 102
Die-setting tool*, May p. 78
Dies, triple action draw type*, Aug. p. 78
Dimensioning, Nov. p. 85
Dimensioning holes and tolerances, May p. 121
Drafting, simplified, appraisal of*, Feb. p. 224
Drawing, titanium, Oct. p. 123
Dressers, orientation of diamonds for grinding wheel, Dec. p. 108
Drift key, spindle*, Nov. p. 81
Drill feed for lathes*, Mar. p. 81
Drill press forms wire parts*, Aug. p. 76
Drill-reaming jig*, June p. 80
Drilling,
bisecting holes on special machine tools*, May p. 107
chamfered step type*, Feb. p. 95
holes on helix*, Jan. p. 80
multiple spindle tool*, Feb. p. 92
plastics, Feb. p. 117
tapping, countersinking of miniature parts, Oct. p. 86
Drills, opposed spindle machine *, Dec. p. 87
Drills, removing broken*, Jan. p. 78
Drills, size identification of*, June p. 80
Driver, stud, Nov. p. 90
Drives for machine tools, electromagnetic, European*, July p. 180
Drives, machine use of flat belt type*, June p. 204
Drop-hammer die, polyamide resin, May p. 96
Dual-purpose die*, May p. 79
Dual ram broach*, Dec. p. 104
Duplicate tool grinder for profile lathe tools in production parts*, June p. 98
Dynamometer, Dec. p. 114
Dynamometer, records torque, Oct. p. 107
Dynamometer, research, Oct. p. 107

—E—

Economics of production, depreciation of plant and equipment, Sept. p. 81
Education,
engineering graduates*, June p. 219
requirements for tool engineering career, June p. 83
tool engineering, Feb. p. 77
tool engineers, of, Mar. p. 73
Effective engineering management*, Nov. p. 214
Electrical blackboard*, Oct. p. 108
Electrical power and tool engineering, Mar. p. 117
Electrodischarge machining, Nov. p. 99
Electrolytic grinding, Nov. p. 99
Electrolytic grinding of hard materials, Aug. p. 96
Electromagnetic clutches and brakes for computer*, May p. 95
Electromagnetic drives for machine tools, European*, July p. 180
Electronic circuits, June p. 99
Electronic circuits, standardization of, June p. 99
Electrospark machining, in Switzerland*, May p. 204
Employee communication, needs for*, May p. 224
Employees, training for engineers, Feb. p. 77
Engineering,
approach to production, Mar. p. 125
automation and*, Feb. p. 219
better future, a*, Oct. p. 211
development, advanced research, Dec p. 198
education for*, May p. 219

*Brief article less than 1 page

nineteen—fifty seven

education of prospects for 1957 graduates*, June p. 219
education, training of draftsmen*, Feb. p. 224
growth in manufacturing side, June p. 83
human, cuts accidents*, Apr. p. 226
low-cost production, Jan. p. 73
management*, Nov. p. 214
managers*, Sept. p. 220
managers, development of*, Sept. p. 220
opportunities in manufacturing*, Mar. p. 280
organization for aircraft manufacturer*, June p. 210
properties of pattern waxes, Nov. p. 95
research, Nov. p. 75
role in management, and*, Feb. p. 216
time saving*, Sept. p. 216
tool, trends in, Mar. p. 73
use of student help in*, Mar. p. 113
value added by*, June p. 218
Engineering Training,
program in NBS*, Feb. p. 113
program at Timken, Feb. p. 77
Engineers,
atomic age in the*, May p. 219
effective utilization, Dec. p. 193
in manufacturing, Dec. p. 193
nuclear*, Oct. p. 211
opportunities in manufacturing*, Mar. p. 280
scientists, their role in society, and*, Apr. p. 222
Epoxy bonding agents for ceramic tool tips, July p. 101
Epoxy cements for ceramic tools, May p. 100
Epoxy resins, Nov. p. 117
Epoxy resins, in plastic tooling, controlling physical properties of, June p. 89
Expanding arbor*, Oct. p. 95
Expanding mandrel forming, Sept. p. 105
Expanding mandrels, hydraulic cylinder production, Aug. p. 101
Explosive forming, development of, July p. 83
External grinding*, Dec. p. 100
Extrusion billets*, Sept. p. 101
Extrusion billets cast continuously*, Sept. p. 101
Extrusion, cold of titanium*, Mar. p. 272
Extrusion, impact, aluminum progress in*, June p. 214

—F—

Fabricated tools, Dec. p. 109
Fabrication, modular construction, Oct. p. 119
Facing, Dec. p. 93
Facing past center, formulas, Dec. p. 121
Fatigue strength, Nov. p. 99
Feed screw cleaner*, June p. 79
Feeders, vibratory hopper, May p. 80
Feeds and speeds for ceramic cutting tools in production, May p. 100
Feeds and speeds for ceramic tools, Mar. p. 133
Feeds and speeds for honing, Aug. p. 117
Filler metals for brazing, June p. 121
Finish, surface standards, German*, Mar. p. 264
Finishing,
abrasive belts, with, Feb. p. 127
barrel operations, Dec. p. 105
barrel operations, equipment and methods, Apr. p. 109
carbide vs. ceramic tools, comparison of, Apr. p. 97
finishing, Nov. p. 99
machines, Sept. p. 98
machines, standard units from, Sept. p. 98
process, high-precision lapping*, May p. 220
Fire-resistant hydraulic fluids, Oct. p. 113
Fixture design,
automatic indexing in mill*, Mar. p. 82
cutting grinding*, for, June p. 82
design, Nov. p. 123
multipurpose*, Oct. p. 78
simultaneous operations, permits*, Sept. p. 100
turning*, Oct. p. 80
two-station rotary honing operation, for*, Apr. p. 107
work-holding, quick-change*, July p. 82
Fixtures,
abrasive belt grinding for, Sept. p. 120
fixtures, Nov. p. 123
polyamide epoxy resin, checking of, May p. 96
satellite production in, Mar. p. 83
vacuum holding type aircraft for, Aug. p. 98
Flange forming, buckling limits for, Mar. p. 105
Flash welder trims part, May p. 93
Flat belt drive, German use of*, June p. 204
Flatness measurements, Nov. p. 114
Fluid power, Dec. p. 81
Fluorocarbons, machining of, Jan. p. 109
Fluorocarbons, secondary machining of, Feb. p. 117
Fluxing, centralized brazing for*, Feb. p. 116
Foreign research milling in*, July p. 179
Forging, welded structures*, Nov. p. 216
Form dies, new alloy made of*, May p. 217
Form rolling, threads, May p. 87
Formed wire parts, drill press use of*, Aug. p. 76
Forming, see also Press forming, Spinning
die*, June p. 81
die, multiple forming operation*, June p. 81
explosive type, July p. 83
forming, Sept. p. 105
power rolling by, Mar. p. 99
sheet metal parts, appliance industry in*, Aug. p. 105
stretch type aircraft in, Feb. p. 107
stretch type, plate buckling flanges of, Feb. p. 85
titanium sheet, Oct. p. 123
tool formulas, Dec. p. 121
Formulas, machinery replacement, for, July p. 95
Formulas, measuring involute helicoids, Sept. p. 95
Formulas, over-pin measurement, Sept. p. 95
Formulas, tools that face past center, for, Dec. p. 121
Four-slide press for progressive die, Jan. p. 81
Funnel directing coolant flow for*, Jan. p. 80
Future developments in aircraft, Dec. p. 194
Future manufacturing of*, June p. 216

—G—

Gages,
gages, Nov. p. 114
groove diameters, for*, July p. 79
height setting*, Nov. p. 83
improvised indicating*, Nov. p. 84
Gaging, see also Inspection
controlling cost of, Aug. p. 79
gaging, Nov. p. 114
hole tolerances*, Sept. p. 78
interferometer system, with*, Aug. p. 95
multiple dimensions unit*, Mar. p. 104
nuclear methods, with*, June p. 209
tape control, Sept. p. 213
Gasket tool lathe for*, May p. 79
Gear,
blank machining pin arbor with*, May p. 106
cutting, intermittent cuts*, Jan. p. 90
gage tracer*, Nov. p. 102
grinding machine*, Feb. p. 93
inspection, over-pin measurements, June p. 116
motors*, Dec. p. 90
motors, design*, Dec. p. 96
production, warm pressing in Germany by*, May p. 204
shaving, integration machines of*, Aug. p. 92
Gears, over-pin measurements, June p. 116
Geometry of chip breakers, titanium and steel, Mar. p. 91
Grinder,
crankpin*, Oct. p. 98
precision surface, Nov. p. 91
surface large jobs for*, Aug. p. 94
Grinding,
automatic carbide face mills of*, May p. 108
automatic transfer type*, Mar. p. 103
cutting forces surface type in*, May p. 203
electrolytic hard materials of, Aug. p. 96
fixture milling cutters for*, June p. 82
grinding, Nov. p. 99
grinding wheel research abroad and*, Jan. p. 200
internal and external spherical, triangles, squares, ellipses, and circles*, Dec. p. 100
jig shear blade edges for*, p. 84
large shafts production on*, July p. 112
machine precision gears for*, Feb. p. 93
punch faces*, Jan. p. 78
sound amplification in dressing use of*, Mar. p. 124
spring-loaded center*, Nov. p. 81
surface*, Nov. p. 104
surface, cutting forces*, Apr. p. 215
surface, European research*, Mar. p. 263
triangles, squares, ellipses and circles*, Dec. p. 100
vibration, theory of*, May p. 205
wheel dressers, orientation of diamonds for, Dec. p. 108
wheels, unbalance in*, May p. 203
wheels, diamond powder, made of*, June p. 102
wheels, diamond powder, from*, June p. 102
Grooving tool, adjustable*, Nov. p. 80
Guided missile, unmanned vehicles, Dec. p. 194

—H—

Hand polishing, Nov. p. 99
Hard coating, Dec. p. 109
Hard chrome plate, electrochemical method, Oct. p. 116
Hard facing, Dec. p. 109
Hardness testing methods in industry*, June p. 205
Hardness, wax, Nov. p. 95
Heat,
resistant alloys, Oct. p. 124
treatable carbides, Apr. p. 103
treating, collets*, June p. 81
treating facility, Sept. p. 103
treating punches and dies, Dec. p. 96
Heating and ventilating production plants, Jan. p. 99
Heavy billets form extrusion billets*, Sept. p. 101
Height setting gage*, Nov. p. 83
Helicoids, over-pin measurements of, June p. 116
High-speed machining in Russia*, Apr. p. 215
High-Temperature,
alloys, Dec. p. 194
alloys, molybdenum type show promise*, July p. 199
materials, plastic*, Apr. p. 227
uses, stainless steel*, Oct. p. 212
High velocity forming with explosives, July p. 93
Hinge manufacture, progressive dies, Feb. p. 99
History of tool engineering, Mar. p. 117
Hobbing, transmission shaft flange*, May p. 107
Holding parts with tape*, Nov. p. 83
Hole spacing on helix*, Jan. p. 80
Hole tolerances*, Sept. p. 78
Hole tolerances, converting to orthographic form, May p. 121
Honed bore size, by liquid pressure, Nov. p. 94
Honeycomb paneling, Dec. p. 91
Honing,
carbide tool, Kolesov, of, Jan. p. 97
machine cuts costs*, Sept. p. 99
operation on motor shafts*, Apr. p. 107
speeds for internal and external cylindrical services, Aug. p. 117
Hopper feeders, vibratory type, May p. 80

*Brief article less than 1 page.

SUBJECT INDEX

How to determine production tolerances, Oct. p. 81
Human engineering reduces accidents*, Apr. p. 226
Hydraulic components, Dec. p. 81
Hydraulic fluids, Dec. p. 81
Hydraulic fluids, fire-resistant, Oct. p. 113
Hydraulic power systems, Dec. p. 81

—I—

Ideas, how to produce more, Apr. p. 71
Illumination improves plant efficiency, Nov. p. 115
Impact extrusion, aluminum*, June p. 214
Impact forming with explosives, July p. 83
Improved plant efficiency, illumination, Nov. p. 115
Increased wear life with nylon coating*, Nov. p. 98
Indexing fixture, automatic for milling*, Mar. p. 82
Indicating gage*, Nov. p. 84
Indicator points of carbide*, Apr. p. 77
Induction casting, mono-shell process, Sept. p. 117
Industrial,
  electronics, standardization of, June p. 99
  engineers and quality control*, Oct. p. 210
  espionage and patents, Jan. p. 94
  photography, camera records small lot tooling, June p. 101
  processes, Dec. p. 198
  research, Dec. p. 198
Industries water supply *, Mar. p. 275
Inflation, accounting for in depreciation policies on machinery, Sept. p. 81
Insert tools, carbide vs. brazed, Apr. p. 85
Inserts, indexable, button type for profile turning, Feb. p. 114
Inspecting, helicoid forms with available pins, Sept. p. 95
Inspecting, involute helicoid forms, Sept. p. 95
Inspection, see also Gaging
  abrasive wheels for safety, of, Apr. p. 119
  over-pin measurements of helicoid forms, June p. 116
  problems, dial indicators, Nov. p. 111
  problems simplified with dial indicators, Nov. p. 111
Instruments, atomic*, Sept. p. 221
Integrated stamping, assembling and welding operations*, Oct. p. 110
Interchangeability, tolerances for, determination of, Oct. p. 81
Interferometer gaging system for measuring and sorting*, Aug. p. 95
Internal grinding*, Dec. p. 100
Internal thread machining, buttress type*, July p. 112
International machine tool show*, Jan. p. 200
Inventions and patents, Jan. p. 94
Inventors and developers of machine tools, Mar. p. 117
Investment casting, Sept. p. 115
Isotope gaging of industrial processes*, June p. 209

—J—

Jig borers, programming of, European practice*, Jan. p. 201
Jig design,
  design, Nov. p. 123
  drilling and reaming*, June p. 80
  grinding shear blade edges, for*, Feb. p. 84
  induction brazing, ceramic, for, July p. 119
  toolmaker's locating*, Sept. p. 80
Jigs,
  fixtures for aircraft assembly, axiomatic assembly, and, Apr. p. 78
  fixtures standards, and, Nov. p. 123
  jigs, Nov. p. 123
Joining, Dec. p. 111

—K—

Key, spindle drift*, Nov. p. 81
Knurling, Sept. p. 125
Kolesov tools, experience with, Jan. p. 97

—L—

Laminated plastic paneling, Dec. p. 91
Laminated plastics, secondary machining of, Feb. p. 117
Laminates,
  glass, asbestos and graphite, machining of, Jan. p. 109
  glass, asbestos and graphite, secondary machining of, Feb. p. 117
  tooling controlling physical properties of, in, June p. 89
Lathe,
  drill feed*, Mar. p. 81
  sliding bed, with*, Mar. p. 102
  tapping tool *, June p. 79
  twin-head for production*, July p. 94
Liaison between manufacturing and engineering, material specifications*, Feb. p. 221
Line boring operation*, Apr. p. 106
Linear shrinkage, Nov. p. 117
Liquid metals pump*, Mar. p. 104
Loading fixture*, Dec. p. 104
Locating,
  device for lathe boring*, Mar. p. 80
  jig*, Sept. p. 80
  jig toolmaker's*, Sept. p. 80
Locator for stamping dies*, Sept. p. 79
Lost wax process, Nov. p. 95
Low-cost die*, Oct. p. 77
Low-cost form dies with longer life*, May p. 217
Low-cost tooling, techniques and materials, Apr. p. 219
Low spring back forming, explosive type, July p. 83
Lubricants for hot forming of titanium, Oct. p. 123
Lubricants, silicone, where to use*, Jan. p. 215

—M—

Machinable carbides, Apr. p. 103
Machinability, effect of residual stresses, Apr. p. 92
Machine accessories,
  built-in automatic screw machine*, June p. 96
  cogged belts prevent grinding marks*, Feb. p. 94
  drive*, Feb. p. 95
Machine capability, predicting, Jan. p. 87
Machine control,
  tape type, Aug. p. 83
  transducer used as*, Jan. p. 92
Machine design, automatic assembly planning, Feb. p. 96
Machine drives, use of flat belt*, June p. 204
Machine,
  speeds, controlled automatically*, June p. 205
  spinning operations assembly, Oct. p. 94
  testing, Jan. p. 87
Machine tool,
  bearings*, Mar. p. 264
  design history*, Mar. p. 265
  developments, Mar. p. 73
  show, international, at London*, Jan. p. 200
Machine tools, see also specific operation
  application of carbides to older, Mar. p. 127
  special applying, May p. 73
  capability measurement of, Jan. p. 87
  costs of replacement, June p. 73
  history of, Mar. p. 117
  large surface grinder forecastings*, Aug. p. 94
  numerical controlled, lathe*, Mar. p. 114
  realistic depreciation policies for Lifo, Sept. p. 81
  scalping machine for aluminum piston*, May p. 94
  special drilling*, Apr. p. 106
  special for drilling bisecting holes*, May p. 107
  tape control, organization for*, May p. 221
  vibration mounts for, July p. 105
Machinery replacement, developing formulas for, July p. 95
Machining, see also specific operation
  contour parts in aircraft*, Feb. p. 226
  contour parts, future problems in aircraft production, of*, Jan. p. 212
  die blocks*, Apr. p. 76
  electrospark method*, May p. 204
  experiments in residual stresses, Apr. p. 92
  fine threads*, July p. 181
  fine threads, European practice*, July p. 181
  high-speed in Russia*, Apr. p. 215
  hydraulic cylinders, Aug. p. 101
  internal thread, buttress type*, July p. 112
  large gears*, July p. 111
  operations, reducing costs of*, May p. 205
  parts for nuclear uses*, Jan. p. 100
  plastics abroad*, Jan. p. 201
  plastics cutting and turning, Jan. p. 109
  plastics, secondary operations, Feb. p. 117
  rough and finished*, Dec. p. 101
  titanium, chip breaking, Mar. p. 91
Magnesium fabricating, satellite production, Mar. p. 83
Magnesium forming, satellite tooling, Mar. p. 83
Magnetic angle plate*, June p. 78
Maintenance,
  machining, with sliding bed lathe*, Mar. p. 102
  metalworking plants, reducing, in*, June p. 215
  operations, Dec. p. 194
  small plants, in*, Apr. p. 228
Make-or-buy decisions by operations research*, Mar. p. 276
Management,
  big business, of*, Jan. p. 213
  development, Dec. p. 73
  development program for, Oct. p. 73
  economic justification of automation, June p. 109
  effective engineering*, Nov. p. 214
  employee communication, and*, May p. 224
  engineers role in*, Feb. p. 216
  engineers utilization of, Dec. p. 193
  improving welding shop operation*, Feb. p. 223
  labor relations, and*, Feb. p. 219
  management, Dec. p. 73
  manufacturing, deciding make-or-buy with OR, July p. 73
  manufacturing in mass production, Jan. page 205
  organization for aircraft engineering*, June p. 210
  plant equipment machinery replacement, Sept. p. 81
  quality control, and*, Jan. p. 210
  tool engineering at Schlumberger, Mar. p. 125
  training engineers for*, Aug. p. 200
Mandrel, alignment for*, Aug. p. 76
Mandrel machines, bulge forming, Sept. p. 105
Mandrel, precision expanding stub*, Feb. p. 83
Manufacturers, automation for small*, Nov. p. 219
Manufacturing,
  cost studies, Jan. p. 73
  costs, planning reduction in, July p. 87
  costs reduction programs, July p. 87
  development, Nov. p. 75
  engineering, material specifications in, Feb. p. 221
  engineering opportunities*, Mar. p. 280
  engineers in, Dec. p. 199
  improvements, labor stake in*, Feb. p. 216
  management, development of engineers for, Oct. p. 73
  management in mass production, Jan. p. 205
  paper work handled by computers*, Mar. p. 278
  research, Nov. p. 75

*Brief article less than 1 page.

nineteen—fifty seven

research, a plan for the future, Nov. p. 75
Marquenching, Sept. p. 103
Marquenching, mass, Sept. p. 103
Material specifications, manufacturing vs. engineering*, Feb. p. 221
Materials,
brazing filler metals, June p. 121
casting, Oct. p. 124
heat and corrosion-resistant, Oct. p. 124
physical characteristics of bent tubes, Mar p. 136
plastic sandwich construction*, Feb. p. 220
producing strip stock from power metal*, Aug. p. 91
properties of new type carbides, Apr. p. 103
steels for tools and dies, July p. 121
vinyl clad steel*, Aug. p. 206
Materials handling,
automatic production, in*, Sept. p. 218
packaging, and*, Sept. p. 215
transfer machines, without pallets, in*, July p. 93
Measurement for quality control*, Dec. p. 100
Measurements, for helical forms, June p. 116
Mechanical blackboard aids engineers*, July p. 113
Mechanization, vs. automation, justification of, June p. 109
Mechanized production, plant planning for, Aug. p. 109
Merry-go-round multistation welding fixture*, Nov. p. 105
Metal-cutting research, European*, Jan. p. 202
Metal displacement by rolling, Mar. p. 99
Metal finishing,
abrasive belts, with, Feb. p. 127
barrel type planning operations, May p. 113
Metal forming, Nov. p. 107
Metal parts, nylon coating*, Nov. p. 98
Metallizing polystyrene reflectors*, May p. 105
Metals for atomic age*, Sept. p. 223
Metals for the future*, Nov. p. 221
Milling, see also Machining; Metal-cutting
boring large parts, and*, July p. 111
carbides on older machines, with, Mar p. 122
ceramics and production, with, May p. 100
cutters, grinding automatically*, May p. 108
internal cams*, July p. 80
large parts*, July p. 110
machine, airfoil*, Oct. p. 112
machine setup for line boring*, Apr p. 106
research, European*, July p. 179
research, German*, Apr. p. 216
setup, fast*, Jan. p. 103
template*, Apr. p. 76
Miniature parts handling, Oct. p. 86
Miniaturization, Oct. p. 86
Mitab (Michigan Transportation and Assignment Blackboard) aids engineering*, July p. 115
Mobilization, of production*, May p. 223
Modification of plastic tools, Mar. p. 86
Modular construction cuts design and fabrication costs, Oct. p. 119
Molybdenum for aircraft applications*, Nov. p. 212
Molybdenum alloys show promise*, July p. 199
Mono-shell process, investment casting, Sept. p. 117
Mounting of abrasive wheels, Apr. p. 119
Mounting production machines to control vibration, July p. 105
Multiple die construction*, June p. 83
Multipurpose fixture*, Oct. p. 78
Multispindle machine for scalping aluminum pistons, May p. 94

—N—

Nondestructive testing, advances in production*, Aug. p. 204
Nondestructive testing, methods of*, July p. 198
Nuclear,
controls for industrial processes*, June p. 209
energy and tool engineering, Mar. p. 117
engineers*, Oct. p. 211
techniques for study of surface coatings*, Nov. p. 220
tooling programs, Sept. p. 88
weapons, Dec. p. 196
Numerical control,
lathe, of*, Mar. p. 114
machine tool builder looks at, Nov. p. 211
machine tools, of, Mar. p. 77*; Aug. p. 83
numerical control, Nov. p. 211
Nut runners in assembly*, Aug. p. 108
Nut running in assembly of connecting rods and caps*, June p. 94
Nylon,
coating for metal parts*, Nov. p. 98
machining of, Jan. p. 109
secondary machining of, Feb. p. 117

—O—

Operation of abrasive wheels, Apr. p. 119
Operations research, make-or-buy, Mar. p. 276*; July p. 73
Opposed spindle machine*, Dec. p. 87
Orientation devices for parts feeding, May p. 80
Orientation of grinding wheel dresser diamonds, Dec. p. 108
Over-pin measurement, formulas, Sept. p. 95

—P—

Package reactor test indicates future power source*, Sept. p. 108
Packaging*, Sept. p. 215
Packaging and handling materials*, Sept. p. 215
Parallels for lathe chucks*, Apr. p. 76
Partial automation for small runs*, Dec. p. 88
Parts feeders, vibratory, May p. 80
Patents on shop tools and processes not for sale, Jan. p. 94
Path equation method of determining tolerances, Oct. p. 81
Pattern waxes, Nov. p. 95
Peen-forming machines*, Dec. p. 86
Performance records, setting up die, Oct. p. 102
Phenolic,
dies, June p. 87
machining of, Jan. p. 109
secondary machining, Feb. p. 117
Photography, tooling aid, as a, June p. 101
Physical properties,
pattern waxes, Nov. p. 95
tooling carbides, Apr. p. 103
tooling plastics, June p. 89
Planing plastics, Feb. p. 117
Planing tough casting*, Jan. p. 101
Planning barrel finishing operations, Dec. p. 105
Plant engineering, heating system developed Jan. p. 99
Plant layout,
lighting, Nov. p. 115
planning, Aug. p. 109
tour, Schlumberger, Mar. p. 125
Plant maintenance, Dec. p. 195
Plant management, maintenance operations, Dec p. 195
Plastic fixtures, Dec. p. 91
Plastics,
controlling physical properties, tooling materials, of, June p. 89
finishing, barrel type, May p. 113
high-temperature use, for*, Apr. p. 227
molds sintered inserts*, Sept. p. 79
production, cost of tools for*, June p. 212
quality control, Oct. p. 99
research report, Nov. p. 117
sandwich construction*, Feb. p. 220
solders of polyamide epoxy resin, May p. 96
tool plastics, Nov. p. 117
use, prototype models, in*, May p. 223
Plastics tooling,
dies and gages, controlling properties of, June p. 89
developments in*, Feb. p. 222
repairing and modifying, Mar. p. 86
Plating, preparation of parts for in barrel, May p. 113
Plug, centering for beveling pipe*, Jan. p. 79
Plunge hobbing transmission shaft flange*, May p. 107
Polishing, abrasive belts, with, Feb. p. 128
Polishing, barrel finishing, May p. 113
Polyamide resins, tooling for, May p. 96
Polygon grinder*, Dec. p. 100
Polystyrene, machining of, Jan. p. 109
Polystyrene plastics, secondary machining of, Feb. p. 117
Powder, diamond for grinding wheels*, June p. 102
Power quill, high-speed for drilling and grinding*, Jan. p. 93
Power roll forming, Mar. p. 99; Nov. p. 107
Power-supply circuits, electronic standardization, June p. 99
Powered metal strip production*, Aug. p. 91
Precision casting, investment type, Feb. p. 109
Precision castings of refractory materials, Sept p. 115
Precision inspection with dial indicators, Nov p. 111
Precision investment casting, Nov. p. 95
Precision surface grinder, Nov. p. 91
Preparation for tool engineering, June p. 83
Press mounting to control vibration, July p. 105
Press operation,
automation of and economic analysis, June p. 109
four-slide or progressive die, Jan. p. 81
hinge production, Feb. p. 99
Pressing spur gears*, May p. 204
Preventive maintenance in metalworking plants reduces maintenance*, June p. 215
Printed circuits, assembly of*, Aug. p. 108
Printed circuits boards*, Dec. p. 101
Process, see also specific operation
analysis low-cost production, for, Jan. p. 73
controls, nuclear types*, June p. 209
development, Nov. p. 75
planning for numerical control, Aug. p. 86
Processing, barrel finishing, Dec. p. 105
Processing, data*, Sept. p. 90
Producibility, engineering process planning, in, Jan. p. 73
Producing nuclear parts, machining*, Jan. p. 100
Production,
abrasive belt grinding, Sept. p. 120
challenges of the future*, June p. 216
design, automation, July p. 193
engineering, design Schlumberger at, Mar p. 125
lathe, twin head type*, July p. 94
layout mechanized production, for, Aug. p. 109
low-cost, planning for, Jan. p. 73
management, automotive, Jan. p. 205
planning, uses OR*, Mar. p. 277
process, shot peening jet blades, Nov. p. 127
redesign machine base, of, July p. 113
special machine speeds*, Sept. p. 102
techniques military mobilization, for*, May p. 223
tolerances, path equation for, Oct. p. 81
trends, Oct. p. 207
Profile turning, positive-rake inserts, Feb. p. 114
Program quality control, setting up, Oct. p. 99
Programmed machine tools*, Mar. p. 77
Programming of automatic lathe*, Mar. p. 114
Programming jig borers*, Jan. p. 201
Progressive dies vs. four-slide presses, Jan. p. 81
Progressive dies, hinge production, in, Feb. p. 99
Projection welder*, Dec. p. 103
Protective clothing*, Sept. p. 87
Protective creams*, Sept. p. 87
Protective coatings, silicone type*, Apr. p. 230
Prototype models, use of plastics, in*, May p. 223
Phychologist looks at supervision*, Nov. p. 215
Pull reaming, prevents runout problems, Sept. p. 91
Pump, centrifugal canned for hazardous fluids*, July p. 90
Pump, liquid metals for*, Mar. p. 104
Punch, combination staking and lubricator*, Feb. p. 82
Punching plastics, Jan. p. 109

*Brief article less than 1 page

SUBJECT INDEX

—Q—

Quality control,
electric motor line, on*, June p. 107
industrial engineers*, Oct. p. 210
machine capability, and, Jan. p. 87
management should know about, what*, Jan. p. 210
measurements*, Dec. p. 100
plastics, Oct. p. 99
quality control, Nov. p. 114
trends in*, Nov. p. 217
Quick-change brush head*, July p. 81
Quick-change die*, May p. 79
Quill, power, high-speed for drilling and grinding, Jan. p. 93

—R—

Radiation and human safety*, July p. 201
Reactor test indicates power source*, Sept. p. 108
Real equipment costs, developing formulas for, July p. 95
Reaming, Sept. p. 91
Reaming, pull, Sept. p. 91
Record system for tools and gages, Jan. p. 104
Redesign simplifies processing machine base, July p. 113
Refacing plastic tools, Mar. p. 86
Reinforced plastic dies with metal inserts, June p. 87
Removing broken drills*, Jan. p. 78
Repair of plastic tools, Mar. p. 86
Replacement formulas, development of, July p. 95
Replacement of machine tools, determining total costs of, June p. 73
Research,
ceramic tool applications on today's machines, Sept. p. 109
cutting edge temperature, in*, Mar. p. 265
dynamometer, Oct. p. 107
metal-cutting, European*, Jan. p. 202
operations used in make-or-buy, July p. 73
replacement of the central materials, Dec. p. 198
research, Dec. p. 198
Residual stresses, machining operations, Apr. p. 92
Resins, polyamide and epoxy for tooling, May p. 96
Resistance welder trims flash, May p. 93
Resistance welding, automated machine setup, June p. 103
Resonance and chatter during shaving operations, automatics, June p. 92
Retractable locator*, Sept. p. 79
Rigid vinyl, secondary machining of, Feb. p. 117
Ring type rubber gaskets, tool for*, May p. 79
Roll forming, in power lathe, Mar. p. 99
Routing plastics, Feb. p. 117
Rubber finishing, barrel type, May p. 113
Rubber forming, contour type, buckling limits for, Mar. p. 105

—S—

Safety, abrasive wheels, Apr. p .119
Safety, radiation background, in*, July p. 201
Scalping machine for aluminum pistons*, May p. 94
Scientific research, aircraft, Dec. p. 194
Scientists and engineers, their role in society*, Apr. p. 222
Scrap reduction in shaving operations, automatics, June p. 92
Screwdriver, air-powered for assembly work*, June p. 108
Screw machine knurling operation, Sept. p. 125
Screw threads, over-pin measurements, June p. 116
Search for hardier alloys*, Nov. p. 101
Selection of gages, controlling cost, Aug. p. 79
Semiautomatic assembly, miniature parts, Oct. p. 86
Semiautomatic lathe for production*, July p. 94
Shaping plastics, Feb. p. 117
Shaving operations, for reducing chatter in, June p. 92
Shaving and deburring operation*, Nov. p. 102
Sheet metal die, corner trimming*, May p. 78
Sheet metal forming*, Aug. p. 105
Sheet metal forming, air conditioner*, Aug. p. 105
Shell molding, applications of*, Apr. p. 224
Short-run production with plastic draw dies, June p. 87
Short-run stamping, template tooling, Oct. p. 205
Shortage of engineers,
solving through training, Feb. p. 77
training company employees, Feb. p. 77
use of student help*, Mar. p. 113
Shot peening*, July p. 110
Shot peening airless method for jet blades, Nov. p. 122
Shrink forming, buckling limits for, Feb. p. 85; Mar. p. 105
Shrink tests developed for tool plastic, Nov. p. 117
Shrinkage, Nov. p. 117
Silicone lubricants, where to use*, Jan. p. 215
Silver brazing fishing reels*, Apr. p. 108
Simplified drafting, appraising*, Feb. p. 224
Single-point ceramic tools, production, May p. 100
Single-point tools in machining plastics, Jan. p. 109
Sintered inserts for plastic molds*, Sept. p. 79
Size control through heat treating, Dec. p. 96
Size identification of drill*, June p. 80
Skin troubles in the shop*, Sept. p. 87
Slender shafts, machining of, Feb. p. 114
Small electric motor production, Aug. p. 109
Small runs, partial automation*, Dec. p. 88
Socket for automatic fastening*, Mar. p. 102
Soldering, selective for printed circuit boards*, Dec. p. 103
Solvents*, Sept. p. 87
Sound amplification for dressing grinding wheels*, Mar. p. 124
Spar milling machine, Swiss*, Apr. p. 217
Spar milling, vacuum chucking for, Aug. p. 98
Spark erosion machining in Germany*, Mar. p. 263
Special alloys, electrolytic grinding of, Aug. p. 96
Special drilling machine for wrench holes*, Apr. p. 106
Special machine automatic index*, Sept. p. 102
Special machine spot faces, reams, bores, and bearingizes*, Sept. p. 102
Special machine tools, application of, May p. 73
Speeds and feeds for honing, Aug. p. 117
Speeds and feeds for turning with ceramics, Mar. p. 133
Spindle drift key*, Nov. p. 81
Spinning operations, assembly machine, Oct. p. 94
Spline, forming die for*, Feb. p. 84
Spot welding, automated machine boasts productivity and quality, June p. 103
Spot welding, multiple, appliance industry*, Aug. p. 105
Spring-loaded grinding center*, Nov. p. 81
Springs, formed on drill press*, Aug. p. 76
Springs, getting the most out of*, July p. 197
Spur gears, pressing of*, May p. 204
Stainless steel, and titanium machining, chip breaking, Mar. p. 91
Stainless steels for high-temperature use*, Oct. p. 212
Staking punch and lubricator*, Feb. p. 82
Staking tool*, Nov. p. 84
Stamping,
dies retractable locator for*, Sept. p. 79
hinge production, progressive dies, in, Feb. p. 99
integrated*, Oct. p. 110
short-run, Oct. p. 205
small items, four-slide press or progressive die, Jan. p. 81
Standard lathe automation*, Nov. p. 82
Standard units finishing machines*, Sept. p. 98
Standardization,
component and modular construction, Oct. p. 119
electronic circuits of, June p. 99
standardization, Nov. p. 123
Standards,
free or dictated, Jan. p. 207
standards, Nov. p. 123
surface finish, German*, Mar. p. 264
Statistical quality control, Nov. p. 85
Statistical quality control on electric motor line*, June p. 107
Steel bonded titanium carbide, Apr. p. 103
Steel savings through cold reducing*, Nov. p. 113
Stellite, Dec. p. 109
Step drilling*, Feb. p. 95
Stock removal by ceramic tools, May p. 100
Stones, for honing, feeds and speeds etc., Aug. p. 117
Stress relieving aircraft machined parts*, July p. 200
Stresses from single-point machining and milling, Apr. p. 92
Stretch forming,
buckling limits in, Feb. p. 85; Mar. p. 105
clamp for, Feb. p. 106
stretch forming, Sept. p. 105
Strip metal for reclaiming scrap*, Aug. p. 91
Stub mandrel, precision expanding type, Feb. p. 83
Stud driver, Nov. p. 90
Submerged arc welding*, Dec. p. 89
Submerged arc welding by pacer*, Dec. p. 89
Superfinish red diamond tool, brass part*, Jan. p. 102
Supervisory development programs, a practical approach to better management, Dec. p. 73
Surface coating, nuclear techniques for study of*, Nov. p. 220
Surface finish, standards, German*, Mar. p. 264
Surface grinder, designed for precision, Nov. p. 91
Surface grinding*, Nov. p. 104
Surface grinding research, European*, Mar. p. 263
Surface roughness, testing in Europe*, July p. 180
Systems management in aircraft manufacturer*, June p. 210

—T—

Tabulating and analyzing, mechanically, Oct. p. 102
Tabulating, by machine, Oct. p. 102
Tape, holding parts*, Nov. p. 83
Tape control,
automatic gaging, Sept. p. 213
machine tools, preparing for*, May p. 221
milling machine, Aug. p. 83
production, training for*, May p. 221
riveting machine*, May p. 112
Tapping plastics, Feb. p. 117
Tapping tool for lathe*, June p. 79
Technical writing, improving, keys for*, Aug. p. 202
Temperature control of plant, Jan. p. 99
Template, milling*, Apr. p. 75
Template, punch grinding of*, Jan. p. 78
Template tooling, Oct. p. 205
Tensile strength, wax, Nov. p. 95
Testing,
hardness, methods of*, June p. 205
nondestructive, production advances*, Aug. p. 204
nondestructive type*, July p. 198
surface roughness, European*, July p. 180
Tests for alignment of mandrel*, Aug. p. 76
Thread cutting, canned motor pump*, Jan. p. 100
Thread cutting with carbide tools, abroad*, Jan. p. 201
Thread production, rolling, May p. 87
Thread rolling, May p. 87
Thread rolling, advantages, methods and equipment, May p. 87
Threading plastics, Feb. p. 117

*Brief article less than 1 page.

nineteen—fifty seven

SUBJECT INDEX

Threads, fine type, machining of in Europe*, July p. 181
Time savings, Dec. p. 93
Time study of toolmaking, foreign*, July p. 179
Timing belts for grinder table drive*, Feb. p. 94
Titanium,
  chip breaking in machining, Mar. p. 91
  cold extrusion of*, Mar. p. 272
  forming sheet, Oct. p. 123
Tolerances,
  converting directional to orthographic form, May p. 121
  determining for production, Oct. p. 81
  gaging costs, and, Aug. p. 79
  machine capabilities, and, Jan. p. 87
  tolerances, Sept. p. 78*; Nov. p. 85
Tool bits, carbide, cracks and stresses in*, Feb. p. 212
Tool bits, ceramic, French experience with, Feb. p. 210
Tool, ceramic makes fine cuts*, Jan. p. 102
Tool for cold rolling shafts*, July p. 80
Tool crib, controlling tools and gages in, Jan. p. 104
Tool for cutoff of tubing*, July p. 79
Tool design, Nov. p. 123
Tool and die steels, applications of, July p. 121
Tool engineering,
  career preparation, June p. 83
  creativity, and, Apr. p. 71
  education, Feb. p. 77
  leading to manufacturing management, Oct. p. 73
  opportunities in*, Mar. p. 280
  shortage, Feb. p. 77
  training for management*, Aug. p. 200
  training programs, Aug. p. 71
  trends in, Mar. p. 73
Tool engineers' calendar*, Mar. p. 121
Tool and gage control system, Jan. p. 104
Tool geometry,
  Kolesov tool, Jan. p. 97
  machining plastics, Jan. p. 109; Feb. p. 117
  residual stresses, Apr. p. 92
Tool life, Dec. p. 114
Tool life, cutting edge temperature research*, Mar. p. 265
Tool plastic, shrink tests developed for, Nov. p. 117
Tool, punch aligning*, May p. 78
Tool, staking*, Nov. p. 84
Tool steel, selection of, July p. 121
Tool steels, welding*, Sept. p. 222
Toolholder,
  design for ceramic tools, May p. 100
  knurling, Sept. p. 125
  quick-change type, for planing tough casting*, Jan. p. 101
Tooling,
  atomic work, for, Sept. p. 88
  automatic system for aircraft, Apr. p. 78
  bending operation, special alloy, or*, Aug. p. 93
  carbides, machinable, weldable, heat-treatable types, with, Apr. p. 103
  costs, clamped vs. brazed carbide, Apr. p. 85
  generating intermittent cuts, for*, Jan. p. 90
  hydraulic cylinder production, Aug. p. 101
  low-cost techniques and materials, Apr. p. 219
  military components, for, Sept. p. 88
  milling template*, Apr. p. 75
  multiple spindle drill*, Feb. p. 92
  plastic controlling physical properties of, June p. 89
  plastic new developments in*, Feb. 222
  plastic parts, cost of*, June p. 212
  plastic repair and modification, Mar. p. 86
  recording with camera, June p. 101
  short-run stamping, for, Oct. p. 205
  tape control, for, Aug. p. 83
  tooling*, Dec. p. 101
  vacuum chucking for aircraft, Aug. p. 98
Toolmaker's locating jig*, Sept. p. 80
Tools,
  ceramic and carbide, finishes from, Apr. p. 97
  ceramic cutting, case studies of, Mar. p. 95
  cutting, ceramic and carbide tests*, Mar. p. 270
  cutting, ceramics vs. carbides on today's machines (MIT tests), Sept. p. 109
  honing, feeds and speeds etc., Aug. p. 117
  machine, large surface grinder forecastings*, Aug. p. 94
  shaving in automatics, chatter of, June p. 92
Tooth form, over-pin measurements, June p. 116
Torch cutting with templates*, July p. 109
Tracer-controlled lathe uses carbide tool*, Jan. p. 103
Training,
  carbide tooling, programs, Aug. p. 71
  engineers in government*, Feb. p. 113
  engineers for management*, Aug. p. 200
  program for tool engineers, Feb. p. 77
  supervisory, Dec. p. 73
  tape control production*, May p. 221
  tool engineering, June p. 83
Training in creativity, Apr. p. 71
Transducer as machine tool control*, Jan. p. 92
Transfer grinder for converter housings*, Mar. p. 103
Transfer machine, see also Automation
  miniature parts, Oct. p. 86
  pallets, without*, July p. 93
Trapped-rubber forming, July p. 83
Trends in production, Oct. p. 207
Trends in quality control*, Nov. p. 217
Trends in tool engineering, June p. 83
Trimmed die, corner*, May p. 78
Trimming, technique for flash*, Mar. p. 80
Triple action draw die*, Aug. p. 78
Tubing, bent, physical properties, Mar. p. 136
Tubing cutoff tool*, July p. 79
Tubular components for aircraft, cold formed, July p. 116
Tumbling, barrel finishing, May p. 113
Tungsten carbide, electrolytic grinding of, Aug. p. 96
Turning, see also Machining; Metal-cutting
  feeds and speeds of, with ceramics, Mar. p. 133
  fixture*, Oct. p. 80
  plastics, Jan. p. 109
  speed, Dec. p. 93
  titanium, chip breaking, Mar. p. 91
  tools, Dec. p. 109
  tools, Kolesov type, experience with, Jan. p. 97
  workpieces with multiple corners*, Feb. p. 211
Turret press and auxiliaries, Nov. p. 92
Turret punch press, Nov. p. 92
Twin head lathe for production*, July p. 94

—U—

Ultrafinishing, high-precision lapping process*, May p. 220
Ultrasonic emulsifier*, Oct. p. 97
Ultrasonic emulsifier, vibrating blade*, Oct. p. 97
Ultrasonic welding, Dec. p. 111
Unbalance grinding wheels in*, May p. 203
Unionarc welding*, Dec. p. 102

—V—

Vacuum chucking aircraft parts, Aug. p. 98
Vacuum metallizing polystyrene parts*, May p. 105
Value added by engineering*, June p. 219
Ventilating and heating production plants, Jan. p. 99
Vibration mounts, machinery, for, July p. 105
Vibration, reducing chatter during shaving, automatics, June p. 92
Vibratory hopper feeders, May p. 80
Vinyl clad steel, a new material*, Aug. p. 206
Vinyl, rigid machining, Jan. p. 109
Viscosity, wax, Nov. p. 95
Vise, milling operations, for*, Jan. p. 103
Volumetric expansion, wax, Nov. p. 95
Volumetric shrinkage, Nov. p. 117

—W—

Warpage of aircraft machined parts, stress relieved for*, July p. 200
Warpage of plastic tools, repair of*, Mar. p. 89
Water, supplies of the future*, Mar. p. 275
Wax, Nov. p. 95
Weldable carbides, Apr. p. 103
Welded structures, forging*, Nov. p. 216
Welded structures improved by forging*, Nov. p. 216
Welder, projection*, Dec. p. 103
Welding,
  aluminum to metals*, Jan. p. 214
  automation of, shielded arc*, Mar. p. 116
  fixture, merry-go-round*, Nov. p. 105
  magnesium, satellite production, Mar. p. 83
  management of shop*, Feb. 223
  presses*, July p. 110
  resistance, machine trims flash, May p. 93
  simplifies design and tooling, July p. 113
  spot, multiple in appliance industry*, Aug. p. 105
  spot type uses automated machine, June p. 103
  tool steel*, Sept. p. 222
  welding*, Dec. p. 89; 103
  welding, Dec. p. 111
Wire brushing operation, quick-change head*, July p. 81
Work changing in milling is rapid*, Jan. p. 103
Work holding, see also Tooling
  fast milling setup in hydraulic vise*, Jan. p. 103
  fixture, quick-change*, July p. 82
  hydraulic cylinder production, for, Aug. p. 101
  vacuum chuck for aircraft parts, Aug. p. 98
Worms, over-pin measurements, June p. 116

*Brief article less than 1 page.

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A

A & C Eng. Co.—Dec.
*Aaron Machinery Co.—Feb., Apr.
Accurate Bushing Co.—Jan., Mar., May, July, Sept., Nov.
Accurate Gear Works—Apr., May, June
Ace Drill Bushing Co.—Feb., July, Sept.
*Ace Drill Corp.—Jan., Feb., Mar., Apr., June, July, Aug., Sept., Nov.
Acme-Danneman Co., Inc., Danneman Die Set Div.—Sept., Oct., Nov.
♦Acme Industrial Co.—Jan., Mar., May, July, Sept., Oct., Nov.
*Acme Tool Co.—Mar., Apr., May, Sept., Nov.
*Adamas Carbide Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Adcock & Shipley—Apr.
Airborne Accessories Corp.—Jan., Mar., May, July, Sept., Nov.
Airetool Mfg. Co.—Aug.
Air Gage Division,
Dearborn Gage Co.—June, Sept., Nov.
Air-Mite Devices, Inc.—Feb., Apr., June, Aug., Oct., Dec.
Air Transport Equipment Co., Inc.—Apr.
Air-Vacuum Division,
F. J. Littell Machine Co.—Apr.
Alina Corp.—Jan., Mar., Apr., Sept., Nov., Dec.
*Allegheny Ludlum Steel Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Allen Mfg. Co.—Feb., Mar., June, Aug., Oct., Dec.
♦Allied Products Corp.,
Richard Bros. Punch Div.—Jan., Mar., Apr., May, Aug., Oct., Dec.
*Almco Division,
Queen Stove Works, Inc.—Apr., May, June
*American Brake Shoe Co.,
Denison Eng. Div.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov.
American Brass Co., The—Jan., Mar., May, July, Oct., Nov.
American Broach & Machine Co.,
Div. Sundstrand Machine Tool Co.—Feb., Apr., June, Aug., Oct., Dec.
American Chain & Cable Co., Inc.,
Campbell Machine Div.—Feb.
♦*American Chain & Cable Co., Inc.,
Wilson Mechanical Instrument Div.—Jan., Mar., May, July, Sept., Nov.
*American Coldset Corp.—Mar.
♦*American Drill Bushing Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Dec.
American Gage & Machine Co.—Mar.
American Gauge Corp.—June
American Instrument Co.—Nov.
*American Machine & Foundry Co.,
AMF Tool Div.—Feb., Mar., June, July, Sept., Nov.
*American Pullmax Co., Inc.—Jan., Mar.
*American SIP Corp.—Mar., June
American Tool Works Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
♦*Ames, B. C., Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Nov.
Ampco Div.,
Greenfield Tap & Die Corp.—Feb., May, July, Sept.
*Ampco Metal, Inc.—Mar., Apr., May, June, Oct., Nov.
*Anderson, F. E., Oil Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Nov.
♦Anker-Holth Div.—Nov., Dec.
Anocut Eng. Co.—Sept., Nov.
*Apex Tool & Cutter Co.—Feb., Apr., June, Aug., Oct.
Armstrong-Blum Mfg. Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Armstrong Bros. Tool Co.—Jan., Feb., Mar., Apr., June, Sept., Oct., Nov.
*Aro Equipment Corp.—Jan., Mar., May, June, Aug., Oct.
Associated Spring Corp.—Apr.
Asociated Sprirg Corp.,
Raymond Mfg. Co., Div.—May, June, Sept.
*Atlas Press Co., Clausing Div.—Jan., Feb., Mar., Apr., Oct., Nov.
Atrax Co., The—Jan., Mar., May, June, July, Sept., Nov.
*Austin Ind. Corp.—Nov., Dec.
*Automation Devices, Inc.,
Perry Equipment & Eng. Div.—Feb., Mar., June, Aug., Oct., Dec.
Automation Devices, Inc.,
Vibratory Feeder Co., Div.—Apr., July, Nov.
Avey Div.,
The Motch & Merryweather Machinery Co.—Jan., Mar., Apr., May., June, Aug., Sept.
Aviation Developments, Inc.—Jan., Mar.

B

B.S.A. Tools, Ltd.—Mar.
Baird Machine Co.—Jan., Mar., Sept.
*Bakelite Co.,
A Div. of Union Carbide Corp.—Mar., June, Sept., Dec.
Baker Brothers, Inc.—Feb., Apr., June, Aug., Oct.
Balas Collet Mfg. Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Baldwin-Lima-Hamilton,
Hamilton Div.—Jan., Mar., July, Aug., Sept., Dec.
Barber-Colman Co.—Feb., Mar., Apr., May, June, Aug., Sept., Oct., Nov.
Barber-Colman Co.,
Hendey Machine Div.—Feb., May, July, Sept., Oct., Nov.
Barksdale Valves—Feb., Mar., May, July, Sept.
*Barnes Drill Co.—Jan., Mar., May, July, Sept., Nov.
Bath, Cyril, Co., The—Mar., June, Oct.
Bath, John, Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Nov.
Bay State Tap & Die Co.—Feb., Apr., June, Aug., Oct., Dec.
*Beckett-Harcum Co., The—Feb.
Bedford Gear & Machine Co.—Oct.
Behr-Manning Co. — Feb., Apr., June, Sept., Oct.
Bellows Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Besly-Welles Corp.—Jan., Feb., Mar., Apr., May, June, Sept.
Bethlehem Steel Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Black Drill Co.—Mar., June, Oct.
*Blake, Edward, Co.—Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Blanchard Machine Co., The—Feb., Apr., June, Aug., Oct., Dec.
*Bliss, E. W., Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Bodine Corp., The—Mar., Apr., June, Aug., Oct., Dec.
*Boice Gages, Inc.—Jan., Feb.
Borg-Warner Corp.,
Rockford Clutch Div.—Feb., Mar., Apr., May, June, July, Aug., Oct., Nov., Dec.
Boston Gear Works—Mar., Apr., June, Aug., Oct., Dec.
*Boyar-Schultz Corp.—Feb., May, Sept.
Bridgeport Brass Co.—Mar., May, July, Sept., Nov., Dec.
♦*Bristol Co., The—Jan., Mar., Apr., May, June, Aug., Sept., Nov., Dec.
*Brown & Sharpe Mfg. Co.—Feb., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Brush Electronics Co.—Feb., Mar.
*Bryant Gage & Spindle Div.,
Bryant Chucking Grinder Co.—Mar., Apr., June, Aug., Oct., Dec.
♦*Buck Tool Co.—Feb., Mar., May, June, Sept., Oct., Dec.
Buhr Machine Tool Co.—Dec.
Bullard Co., The—Jan., Feb., Mar., Sept., Oct., Nov.
*Burg Tool Mfg. Co.—Jan., Mar., Sept.
Butterfield Div.,
Union Twist Drill Co.—Jan., Mar., May, July, Sept., Nov.

C

Cadillac Gage Co.—Mar., May, July, Sept., Nov.
Campbell Machine Div.,
American Chain & Cable Co.—Feb.
Carborundum Co., The—Mar., Apr., May
*Carborundum Co., The,
Stupakoff Div.—Feb., Mar., Apr., May, July, Sept., Nov., Dec.

Card, S. W., Div.,
Union Twist Drill Co.—Feb., Mar., Apr., June, Oct., Dec.
Cardinal Machine Co.—Mar., July
Carlton Machine Tool Co., The—Jan., Feb., Mar., Apr., May, June, Sept., Oct., Nov., Dec.
*Carpenter Steel Co., The—Jan., Mar., Apr., Aug., Sept., Nov., Dec.
Carr Lane Mfg. Co.—Sept., Oct., Nov., Dec.
*Carter Controls, Inc.—Jan., Mar., May
Casalbi Co.,
Globe Div.—Apr., May
*Cawi Machine Co., Inc.—Aug.
Central Safety Equipment Co.—Mar., May, Sept.
*Cerro de Pasco Corp.—Jan., Mar., May, July, Sept., Nov.
*Challenge Machinery Co.—Jan., Feb., Mar., Apr., July, Sept., Nov.
Chance Vought Aircraft, Inc.—Feb., Apr., June.
♦Chaso Tool Co.—Jan., Mar., May, Nov.
Chicago-Latrobe—Jan., Mar., May, Sept., Nov.
*Chicago Pneumatic Tool Co.—Mar., June, Nov.
*Chicago Rivet & Machine Co.—Jan., Apr., June, Aug., Oct., Dec.
*Ciba Co., Inc.—Feb., Mar.
Cincinnati Bickford Div.,
Giddings & Lewis Machine Tool Co.—Nov.
Cincinnati Grinders, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Cincinnati Milling Machine Co.—Feb., Apr., June
Cincinnati Milling Machine Co.,
Heald Machine Co., Subs.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Cincinnati Shaper Co.—Jan., Feb., Mar., May, June, July, Aug., Sept., Oct., Nov.
Circular Tool Co.—Jan., Feb., Apr., June, Aug., Oct., Dec.
Clark, Robt H., Co.—Oct., Dec.
*Clausing Div.,
The Atlas Press Co.—Jan., Feb., Mar., Apr., Oct., Nov.
♦Clearing Machine Corp.,
Div. U. S. Industries, Inc.—Jan., Mar., June, Sept., Nov.
*Cleco Div.,
Reed Roller Bit Co.—Mar., Nov.
Cleveland Crane & Eng. Co., The—Jan., Mar., May, July, Sept., Nov.
*Cleveland Grinding Machine Co.—Apr., Aug.
*Cleveland Instrument Co., Inc.—Mar.
Cleveland Twist Drill Co.—Mar., May, July, Sept., Nov.
Coast Mfg. & Supply Co.—Mar., May, July, Sept.
*Collins Microflat Co.—Jan., Mar., June, Sept.
Colonial Broach & Machine Co.—Mar., Dec.
*Columbia International Corp.—Jan., Apr.
Columbia Tool Steel Co.—Jan., Apr., July, Oct., Nov.
Commando Tool Co.—Mar.
Composite Forgings, Inc.—Feb., Apr., June, Sept., Nov.
Comtor Co.—Mar., Apr., June, Sept., Oct.
Concentric Tool Corp.—Jan., Mar., May, July, Sept.
Cone Automatic Machine Co.—Jan., Feb., Mar., Apr., May, Sept., Oct.
Cone Automatic Machine Co.,
Pilot Div.—Mar., June, Aug., Oct., Dec.
Continental Tool Works Div.,
Ex-Cell-O Corp.—Jan., Apr., June, Nov., Dec.
Coromant Div.,
Sandvik Steel, Inc.—Jan., Mar., June, Sept., Oct., Nov.
Cosa Corp.—Feb., Mar., Apr., May, June, Sept., Oct., Nov., Dec.
Coulter, James, Machine Co., The—Mar.
Covel Mfg. Co.—Mar., May, Oct., Dec.
*Crafts, Arthur A., Co., Inc.—Jan., Mar., May, July, Sept., Dec.
Cramer Posture Chair Co.—Feb., Mar., Aug., Nov.
*Crane Packing Co.—Jan., Mar., May, June, Sept., Oct.
Cratex Mfg. Co.—Mar.
Cross Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Crucible Steel Co. of America—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Crumpton, W. D., & Co.—Jan., Mar.
*Cushman Chuck Co.—Feb., Mar., June, Aug., Oct., Dec.

D

Danly Machine Specialties, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov.
Danneman Die Set Div.,
Acme-Danneman Co.—Sept., Oct., Nov.
*Davis, A. G., Gage & Eng. Co.—Jan.
Dazor Mfg. Corp.—Jan., Mar., May, July, Sept., Nov.
Deakin, J. Arthur, & Son—Feb., Apr., June, Aug., Oct., Dec.
Dearborn Gage Co.,
Air Gage Div.—June, Sept., Nov.
Dearborn Gage Co.,
Ellstrom Standards Div.—Jan., Feb., Mar., Apr., May, July, Aug., Oct., Dec.
*Delpark Industrial Filtration Co.—Jan., Mar., May, July, Sept., Nov.
Delta Power Tool Div.,
Rockwell Mfg. Co.—Jan., Mar., May, Sept., Oct., Nov.
*Denison Eng. Div.,
American Brake Shoe Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov.
Derbyshire, F. W., Inc.—Nov.
Detroit Broach & Machine Co.—Feb., Mar., July, Sept.
Detroit Die Set Corp.—Mar., May, July
*Detroit Milling Cutter Div.,
Futurmill, Inc.—Mar.
Detroit Mold Eng. Co.—Mar., June
*Detroit Power Screwdriver Co.—Jan., Mar., May, July, Sept., Nov.
*Detroit Reamer & Tool Co.—Feb., Mar., Apr., June, Aug., Oct.
*Detroit Stamping Co.—Jan., Mar., Apr., May, Sept., Oct.
Devcon Corp.—Mar., Apr., June, Aug., Sept., Nov.
*DeVlieg Microbore Div.,
DeVlieg Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Diamond Tool Co.—Nov.
Diamonite Products Mfg. Co.—Mar., May, Oct.
Dickerman, H. E., Mfg. Co.—Jan., Feb., Apr., June, Sept., Nov.
Die Techniques Publishers Div.,
Falcon Eng. Co.—Jan., Feb., Mar., Apr., May, Sept., Oct.
♦*DoALL Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Nov., Dec.
Donley Products, Inc.—Mar.
*Dow Chemical Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Drillunit, Inc.—Mar., May, Sept., Nov.
*Dumore Co., The—Jan., Mar., Apr., May, June, Sept., Oct., Nov., Dec.
Dykem Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

E

E and E Eng., Inc.—Aug.
Eastern Machine Screw Corp., The—Mar., Apr., Sept., Nov.
*Eastman Kodak Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Eclipse Counterbore Co.—Feb., Apr., June, Aug., Oct., Dec.
Edlund Machinery Co.—Mar., May, Sept.
Ehrhardt Tool & Machine Co.—Jan., Mar., May, July, Sept., Nov.
*Electro-Mechano Co.—Jan., Mar., June
Elgin National Watch Co.—Jan., Feb., Apr., June, Aug., Oct.
Elliott-Myers Corp.—Jan.
Ellstrom Standards Div.,
Dearborn Gage Co.—Jan., Feb., Mar., Apr., May, July, Aug., Oct., Dec.
*Elox Corp. of Mich.—Feb., Mar., Apr., July, Aug., Oct.
Emerson Electric Mfg. Co.—Mar.
*Engelberg-Huller Co., Inc., The—Feb., Mar., May, July, Sept., Nov.
*Erickson Tool Co.—Mar., May, Sept.
Ernest, Holdeman & Collett, Inc.
Speedgrip Chuck Div.—May, July, Sept., Nov.
Errington Mechanical Labs, Inc.—Mar.
Ettco Tool Co., Inc.—Jan., Mar., May, Oct.
Ex-Cell-O Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Ex-Cell-O Corp.,
Continental Tool Works Div.—Jan., Apr., June, Nov., Dec.
Ex-Cell-O Corp.,
Rotac Div.—June

F

Fairchild Engine Div.,
Fairchild Engine & Airplane Corp.—July
Falcon Eng. Co.,
Die Techniques Publishers Div.—Jan., Feb., Mar., Apr., May, Sept., Oct.
Famco Machine Co.—Oct.
*Federal Products Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Fellows Gear Shaper Co.—Jan., Mar., June, Aug., Oct., Nov.
Firth-Loach Metal, Inc.—June, Aug.
*Firth-Sterling, Inc.—Jan., Mar., July, Aug., Sept., Oct., Nov., Dec.
*Flick-Reedy Corp.,
Miller Fluid Power Div.—Jan., Feb., Mar., Apr., May, June, July, Aug., Oct.
Flick-Reedy Corp.,
Tru-Seal Div.—Oct.
Fonda, D. C., Gage Co.—Mar., Apr.
Foote-Burt Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Furane Plastics, Inc.—Feb., Mar., June
*Futurmill, Inc.,
Detroit Milling Cutter Div.—Mar.

G

*Gaertner Scientific Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Galland-Henning Mfg. Co.,
Nopak Div.—Apr., May, June, July, Sept., Nov.
*Gammons-Hoaglund Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept.
Gardner-Denver Corp.,
Keller Tool Div.—Jan., Feb., Mar., Apr., May, June, Aug., Sept., Oct., Nov., Dec.
♦Gatco Rotary Bushing Co.—Jan., Mar., June, July, Sept., Nov.
General American Transportation Corp.,
Parker-Kalon Div.—Mar., Apr., May, Sept., Oct., Nov.
*General Electric Co.,
Metallurgical Products Dept.—Feb., Mar., Apr., May, June, Aug., Sept., Oct., Dec.
*General Industrial Diamond Co.—Mar.

Giddings & Lewis Machine Tool Co., Cincinnati Bickford Div.—Nov.
Gilman, Russell T., Co.—Mar.
Gisholt Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Glenzer, J. C., Co.—Jan., Apr., May, Oct.
Globe Div., Casalbi Co.—Apr., May
Goddard & Goddard—Feb., Mar., Apr.
Gorton, George, Co.—Jan., Feb., Mar., May, Sept., Nov.
*Govro-Nelson Co.—Mar., July
Greaves Machine Tool Co.—Jan., Mar., July, Aug., Sept., Dec.
Green Instrument Co.—Nov.
Greenfield Tap & Die Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Greenfield Tap & Die Corp., Horton Chuck Div.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Greenlee Bros. & Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Greist Mfg. Co.—Feb., Apr.
Grob, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Gulf Oil Co.—Feb., Dec.

H

Hamilton Division, Baldwin-Lima-Hamilton — Jan., Mar., July, Aug., Sept., Dec.
*Hammond Machinery Builders, Inc.—Feb., May, Dec.
Hanchett Magna-Lock Corp., Magna-Lock, Inc.—Mar.
*Handy & Harman—Feb., Mar., May, June, Sept., Nov.
Hanlo Gage Co., Div. Johnson Die & Eng. Co.—July
*Hanna Eng. Works—Jan.
*Hannifin Corp.—Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Hanson-Whitney Division, Whitney Chain Co.—Feb., Apr., June, Aug., Oct. Dec.
*Hardinge Bros., Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
♦Hartford Special Machinery Co. — Jan., Mar., Apr., June, July
Harvey Travel Bureau—Jan.
*Haynes Stellite Co., A Div. of Union Carbide Corp., Feb., Mar., June, July, Oct., Dec.
Heald Machine Co., Subs. Cincinnati Milling Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Heinrich Tools, Inc.—Mar., May, July, Sept., Nov.
*Heller Tool Co., Subs., Simonds Saw & Steel Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Hendey Machine Division, Barber-Colman Co.—Feb., May, July, Sept., Oct., Nov.
*Herman Stone Co.—Oct.
High Standard Mfg. Corp., The—June, Sept., Nov.
Hoggson & Pettis Mfg. Co.—Feb., Apr., June, Aug., Oct., Dec.
*Horton Chuck Division, Greenfield Tap & Die Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Hy-Pro Tool Co.—Mar., Apr., June

I

*Ideal Industries, Inc.—Feb., Mar., Apr., June, July, Aug., Oct.
*Industrial Filtration Co., Delpark Div.—Jan., Mar., May, July, Sept., Nov.
*Industrial Tectonics, Inc.—June
*Ingersoll-Rand Co. — Feb., Mar., Apr., June, Sept., Nov.

J

J & S Tool Co., Inc.—Sept., Oct., Nov., Dec.
♦Jacobs Mfg. Co.—Feb., Mar., Apr., Sept., Oct.
Jahn, B., Mfg. Co., The—Feb., Mar., Apr., June, Aug., Sept., Oct., Nov., Dec.
*Jarvis Corp., The—Feb., Mar., Apr., June, Aug., Oct., Dec.
*Jergens Tool Specialty Co.—Mar., Oct.
Jersey Mfg. Co.—Mar., Oct., Dec.
Jessop Steel Co.—Feb., Mar., Apr., May, June, Aug., Sept., Oct.
Johnson Die & Eng. Co., Hanlo Gage Co., Div.—July
*Jones & Lamson Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

K

Kane & Roach., Inc.—July
Kaufman Mfg. Co.—Jan., Apr., July, Oct.
Kearney & Trecker Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Nov.
Keller Tool Division, Gardner-Denver Corp.—Jan., Feb., Mar., Apr., May, June, Aug., Sept., Nov., Dec.
*Kenco Mfg. Co.—Jan.
*Kennametal, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
King Tester Corp.—Feb., Mar., Apr., Sept., Oct., Nov.
Kingsbury Machine Tool Co.—Jan., Feb., Mar., Apr., June, Sept., Oct., Dec.
Klingelhofer Machine Co.—Mar., May
Knight, W. B., Machinery Co.—Feb., Mar., Apr., June, Sept., Oct., Nov.
Krueger-Barnes Corp.—Jan.

L

*Lamina Dies & Tools, Inc.—Feb., Mar., June, Aug., Oct., Dec.
*Landis Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Lapeer Mfg. Co.—Feb., Mar., June, Aug., Oct., Dec.
Lapointe Machine Tool Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Latrobe Steel Co.—Jan., Apr., June, Aug., Oct., Dec.
Lavallee & Ide, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Lee, K. O., Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Lees-Bradner Co.—Jan.
Leland-Gifford Co.—Feb., Apr., June, Aug., Oct., Dec.
*Lempco Industrial, Inc.—July
Lepel High Frequency Labs—Feb., Apr., June, Aug., Oct., Dec.
Levin, Louis, & Son, Inc.—Jan., Mar., May, July, Sept., Nov.
♦Lincoln Electric Co.—Mar., Apr., May, Sept., Oct., Nov.
Lincoln Gage Co.—Jan.
*Lindberg Eng. Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Nov., Dec.
*Linde Co., A Div. of Union Carbide Corp.—July, Aug., Sept., Oct., Nov.
Link Aviation, Inc.—Sept.
Lipe-Rollway, Inc.—Mar., May, June, July, Sept., Nov.
*Littell, F. J., Machine Co., Air-Vacuum Div.—Apr., May, Oct.
*Lodding, Inc.—Feb., Apr., June, Aug., Oct., Dec.
Lodge & Shipley Co., The—Mar., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Logan Eng. Co.—Jan.
♦*Logansport Machine Co.—Jan., Feb., Mar., Apr.
*Lovejoy Tool Co.—Jan., Feb., Mar., June, July, Aug., Oct.
Lucas Machine Div.—Aug.
*Lufkin Rule Co.—Feb., Apr., May, Sept., Oct.

M

*Mac-It Screw Division, Strong-Carlisle-Hammond — Mar., May, Sept., Oct., Nov.
Macklin Co.—Jan., Mar., Apr., July, Sept., Nov.
♦Madison Industries, Inc.—Jan., Feb., Apr., June
Magna-Driver Corp.—Oct.
Magna-Lock, Inc., Hanchett Magna-Lock Corp.—Mar.
*Mall Tool Co., Div. Remington Arms Co., Inc.—Mar., Apr., June, Aug., Oct., Dec.
Manhattan Rubber Division, Raybestos-Manhattan, Inc.—Jan., Mar., May, Oct., Nov., Dec.
Marac Machinery Corp.—Jan., Feb., May
Marshall Steel Co.—Oct.
*Marvel Eng. Co.—Jan., Mar., May, July, Sept., Nov.
*Matthews, Jas. H., & Co.—Feb., Apr., June
*Mayline Co.—Jan., Mar., May, July, Sept., Nov.
*MBI Export & Import, Ltd.—Jan., Feb.
*McCrosky Tool Corp.—Apr., May, June, Sept., Oct., Nov.
McDonough Mfg. Co.—Jan.
McKay Machine Co.—Feb., Mar., May, June, Aug., Sept., Nov.
*Mead Specialties, Inc.—Jan., Mar., July
Melin Tool Co., Inc.—Feb., Apr., June, Aug., Oct., Dec.
Merz Eng. Co.—Nov.
*Metal Carbides Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Metal Cutting Tools, Inc.—May, July, Sept., Nov.
Metal Treating Institute—Mar., Apr., June, Sept., Oct., Dec.
*Metallurgical Products Dept., General Electric Co.—Feb., Mar., Apr., May, June, Aug., Sept., Oct., Dec.
♦Meyers, W. F., Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Michigan Tool Co.—Mar., July, Nov.
Micromatic Hone Corp.—Jan., May
♦*Micrometrical Mfg. Co.—Feb., Apr., June, Aug., Oct., Dec.
Micro-Positioner Corp.—Mar.
Middlestadt Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept.
*Milford Rivet & Machine Co., The—Feb., Mar., Apr., Sept., Oct., Nov.
*Miller Fluid Power Division, Flick-Reedy Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Oct.
Miller, Harry, Corp.—Mar., July, Oct.
Milne, A., & Co.—Mar., May, June
*Mohawk Tools, Inc.—Feb., Mar., May, July, Sept., Nov.
Momar Industries, Inc.—Sept.
Monarch Machine Tool Co.—Feb., May, Sept., Nov.

Monroe Eng. Products Co.—Sept.
*Moore Special Tool Co.—Mar., May, Oct., Dec.
Morris Machine Tool Co.—May, June
Morris, Robert E., Co.—Feb., Apr., June, Aug., Oct., Dec.
*Morse, H. E., Co.—Mar., Sept.
*Morse Twist Drill & Machine Co., Subs. Van Norman Industries, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Motch & Merryweather Machinery Co., The—Jan., Apr., May, June, July, Aug., Sept., Oct., Dec.
Motch & Merryweather Machinery Co., The, Avey Div.—Jan., Mar., Apr., May, June, Aug., Sept., Nov.

N

National Acme Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov.
National Automatic Tool Co., Inc.—Jan., Feb., Mar., Apr., May, July, Sept., Oct., Nov., Dec.
*National Broach & Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
National Tool Co.—Jan., Mar., May, July, Sept., Nov.
National Tool & Die Mfr's Assoc.—Apr., May, June
♦National Twist Drill & Tool Co.—Feb., Apr., June, Aug., Oct., Dec.
Nebel Machine Co., Smith & Mills Shaper Div.—Apr., May, June, Oct., Nov., Dec.
*Nelco Tool Co., Inc.—Jan., Apr., June, Aug., Oct.
New Britain Machine Co., The—Jan., Feb., Mar., Apr., May, July, Dec.
New Britain Machine Co., The, Lucas Div.—Aug.
New Britain Machine Co., The, Gridley Machine Div.—Sept., Oct.
Newcomer Products, Inc.—Feb., Mar., May, July, Sept., Nov.
New-Field Machined Parts Co.—Apr.
*New Hermes Engraving Co.—Jan., Feb., Apr., June, Aug., Oct.
*New York Belting & Packing Co.—Feb., Apr., June, Aug.
New York Twist Drill Co.—Feb., Mar., May, Aug., Oct., Dec.
Niagara Machine & Tool Works—Jan., Mar., May, July, Sept., Nov.
Nice Ball Bearing Co.—Mar., July, Oct.
*Nikon, Inc.—Jan., Mar., May, July, Oct.
Nilson, A. H., Machine Co., The—Jan., Mar., June, Aug., Sept., Nov.
*Nopak Division, Galland-Henning Co.—Apr., June, Sept.
*Norgren, C. A., Co.—Jan., Apr., Sept., Oct., Nov.
*Northwestern Tool & Eng. Co.—Jan., May, July, Sept., Dec.
Norton Co., Abrasive Wheel Div.—Jan., Feb., Mar., May, June, Aug., Oct., Nov., Dec.
Norton Co., Machine Div.—Feb., Apr., June, Aug., Sept., Oct., Nov., Dec.
Novi Tool & Machine Co.—Mar.

O

*Oakite Products, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Ohio Crankshaft Co., Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
♦Ohio Knife Co., Inc.—Feb., Mar.
*O K Tool Co., Inc.—Jan., Mar., May, Aug., Oct., Dec.
Olofsson Corp.—Feb., Apr., June, Aug., Oct., Dec.
*O'Neil-Irwin Mfg. Co.—June, Sept.
Onsrud Machine Works, Inc.—June, Aug., Oct., Dec.
*Optical Gaging Products, Inc.—Feb., Apr., June, Sept., Nov.
Opto-Metric Tools, Inc.—June, Sept., Oct., Dec.
♦*Ortman-Miller Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Osborn Mfg. Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Oslund Precision Products—May

P

*Pacific Ind. Mfg. Co.—Oct., Nov., Dec.
*Panghorn Corp.—Feb., Apr., June, Aug., Oct., Dec.
Parker-Hartford Corp.—Jan., May
Parker-Kalon Division, General American Transportation Corp.—Mar., Apr., May, Sept., Oct., Nov.
Parker-Majestic, Inc.—Jan., May, June
Parkwood Laminates, Inc.—Feb., Mar., Apr., June, Oct., Dec.
Penn Eng. & Mfg. Corp.—Apr., June, Aug., Oct., Dec.
*Perry Equipment & Eng. Co., Div. Automation Devices, Inc.—Feb., Mar., June, Aug., Oct., Dec.
*Petz-Emery, Inc.—Jan., Mar., May, July, Sept., Nov.
Pilot Division, Cone Auto. Machine Co.—Mar., June, Dec.
*Pines Eng. Co., Inc.—Jan., Mar., May, July, Sept., Nov.
*Pioneer Aluminum, Inc.—Feb., Mar., Apr., May, June, July, Aug., Sept., Nov., Dec.
Pioneer Eng. & Mfg. Co.—May, Aug.
Pioneer Tool & Eng. Co.—Mar.
Pipe Machinery Co.—Jan., Feb., Mar., Apr., May, June, Aug., Oct., Dec.
Pittsburgh Tool Steel Wire Co.—Mar.
Pope Machinery Corp.—Jan., Feb., Mar., Apr., May, June, Sept., Oct., Nov.
Porter, H. K., Co., Vulcan Crucible Steel Div.—Jan., Mar., May, July, Sept., Nov.
Potter & Johnston Co., Div. Pratt & Whitney Co., Inc.—Feb., Mar., June, Oct., Nov.
Pratt & Whitney Co., Inc.—Jan., Feb., Mar., Apr., May, June, Aug., Sept., Oct., Nov.
*Precision Tool & Mfg. Co.—Mar., Oct.
*Producto Machine Co., The—Jan., Mar., May, June, Sept., Oct., Nov., Dec.
*Putnam Tool Co.—Feb., Apr., May, Aug., Oct., Dec.

Q

Quality Tool Works—Feb.
*Queen Stove Works, Almco Div.—Apr., May, June

R

R-B Tool Co.—Feb.
*R and L Tools, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Raybestos-Manhattan, Inc., Manhattan Rubber Div.—Jan., Mar., May, Oct., Nov., Dec.
Raymond Mfg. Co., Div. Associated Spring Corp.—May, June, Sept.
*Ready Tool Co.—Mar.
Reed Rolled Thread Die Co.—Jan., Mar., Apr., June, Oct., Nov.
*Reed Roller Bit Co., Cleco Div.—Mar., Nov.
Rehnberg-Jacobson Mfg. Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Reichhold Chemicals, Inc.—Dec.
Reliant Industries, Inc.—Mar.
*Remington Arms Co., Inc., Mall Tool Co., Div.—Mar., Apr., June, Aug., Dec.
♦*Richard Bros. Punch Div., Allied Products Corp.—Jan., Mar., Apr., May, Aug., Oct., Dec.
Ring Punch & Die, Inc.—Aug., Oct., Dec.
Rite-O Tool & Gage Co.—Apr.
*Rivett Lathe & Grinder Co., Inc.—Feb., Apr., June, Aug., Oct., Nov.
*Robbins, Omer E., Co.—Feb., Mar., June, Aug., Oct., Dec.
Rockford Clutch Division, Borg-Warner Corp.—Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Rockwell Mfg. Co., Delta Power Tool Div.—Jan., Mar., May, Sept., Oct., Nov.
*Rockwell Mfg. Co., Walker-Turner Div.—Feb., Apr., June, Aug., Oct.
Rotac Division, ♦Ex-Cell-O Corp.—June
Roto-Finish Co.—Mar., Apr., Sept.
*Rotor Tool Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept.
♦Royco Tap & Tool Co.—Feb., Apr., Oct.
*Russell, Holbrook & Henderson, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Ruthman Machinery Co.—Jan., Mar., May, July, Sept., Nov.
*Ryerson, Jos. T., & Son, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

S

S & E Machine Products, Inc.—Mar., Apr.
Sandia Corp.—Apr.
Sandvik Steel Co., Sandvik Coromant Div.—Jan., Mar., June, Sept., Oct., Nov.
Scherr, Geo., Co.—Jan., Feb., Mar., Apr., May, June, Aug., Sept., Oct., Nov.
*Schrader's, A., Son—Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
♦Scully-Jones & Co.—Jan., Mar., May, July, Aug., Sept., Nov.
*Seibert & Sons, Inc.—Jan., Feb., Mar., May, July, Sept., Nov.
Seneca Falls Machine Co.—Feb., Mar., June, Sept., Oct., Dec.
*Service Machine Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Severance Tool Industries, Inc.—Aug., Oct., Nov.
Sheffield Corp., The—Jan., Mar., Apr., May, June, Aug., Sept., Nov., Dec.
*Sheldon Machine Co.—Jan., Feb., Mar., Apr., May, Sept., Oct., Nov.
Shell Chemical Corp.—July, Aug., Sept., Oct., Nov., Dec.
*Shell Oil Co.—Mar., May, June, July, Aug., Oct., Nov., Dec.
*Sheppard, Stanley—Mar., Apr.
Sidney Machine Tool Co.—Feb., Mar., June, Aug., Oct., Nov.
Simmons, W. T., Co.—Mar.
*Simonds Abrasive Co.—Jan., Feb., Mar., Apr., June, Sept., Nov.
*Simonds Saw & Steel Co.—Jan., Feb., Mar., Apr., May, June, Sept., Oct., Dec.
*Simonds Saw & Steel Co., Heller Tool Co., Subs.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Simplex Machine Tool Corp.—Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

Sinclair Refining Co.—Mar., Apr., May, Sept., Oct., Nov.
*Size Control Co., Industrial Division, American Gage & Machine Co.—Mar.
*Skinner Chuck Co., The—Mar., May, July, Sept., Oct., Nov.
Smit, J. K., & Sons, Inc.—Feb., Mar., May, July, Nov.
Smith & Mills Shaper Division, Nebel Machine Tool Co.—Apr., May, June, Oct., Nov., Dec.
Snow Mfg. Co.—Jan., Mar., Sept.
Snyder Tool & Eng. Co.—Jan., Mar., May, July, Sept., Nov.
Sonnet Tool & Mfg. Co.—Sept.
Sossner Tap & Tool Co.—Jan., Mar., Apr., May, Oct., Nov.
South Bend Lathe Works—Jan., Mar., May, Sept., Oct., Nov.
*S-P Mfg. Corp.—Jan., Feb., Mar., June, Sept., Oct.
Speedgrip Chuck Division, Ernest Holdeman & Collett, Inc.—May, July, Sept., Nov.
Splinemaster Products Co.—Jan., Mar., May
Springfield Machine Tool Co.—June
Standard Die Set Mfrs., Inc.—Jan., May, July, Sept., Nov.
*Standard Gage Co., Inc.—Jan., Feb., Mar., Apr., May, June, July, Sept., Oct., Nov., Dec.
Standard-Modern Tool Co., Ltd.—Feb., Mar., Apr., May, June, July, Dec.
*Standard Parts Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Standard Pressed Steel Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Standard Tool Co.—Jan., Mar., Apr., May, July, Sept., Dec.
Stanley Aviation Corp.—Dec.
Staples Tool Co.—Jan., Mar., May, July, Sept., Nov.
♦*Starrett, L. S., Co., The—Jan., Feb., Mar., Apr., May, June, July, Sept., Oct., Nov., Dec.
Stau, E. H., Co.—Mar., May, July, Sept., Nov.
Stein, Wm. P., Co.—Nov.
*Stone Machinery Co.—Jan., Apr., May, July, Sept., Nov.
*Strong, Carlisle, Hammond Co., Mac-It Screw Div.—Mar., May, Sept., Oct., Nov.
Stuart, D. A., Oil Co., Ltd.—Jan., Mar., May, July, Aug., Sept., Nov.
*Stupakoff Division, The Carborundum Co.—Feb., Mar., Apr., May, July, Sept., Nov., Dec.
Sturtevant, P. A., Co.—Jan., Mar., May, July, Sept., Nov.
Sun Oil Co.—Jan., Feb., Mar., Apr., May June, July, Aug., Sept., Oct., Nov., Dec.
Sundstrand Machine Tool Co.—Feb., Apr., June, Aug., Oct., Dec.
Sundstrand Machine Tool Co., American Broach & Machine Co., Div.—Feb., Apr., June, Aug., Oct., Dec.
*Super Tool Co., Subs. Van Norman Industries, Inc.—Mar., Apr., May, Sept., Oct., Nov.
*Superior Hone Corp.—Apr., July, Oct.
*Superior Pneumatic & Mfg. Co., Inc.—Apr., June
*Superior Steel Products Corp.—Jan., Mar., May, July, Sept., Dec.
*Syntron Co.—Feb., Apr., June, Aug., Oct., Dec.

T

Taft-Peirce Mfg. Co.—Feb., June, July, Sept., Oct., Dec.
*Taylor Dynamometer & Machine Co.—Jan., Feb., Mar.
Thompson Grinder Co.—Jan., Apr., Aug., Sept., Oct., Dec.
Thomson Industries, Inc.—Jan., Mar., May, July, Sept., Nov.
Threadwell Tap & Die Co.—Jan., Mar., May, June, July, Aug., Sept., Oct., Nov., Dec.
Thriftmaster Products Corp.—June, Aug., Oct., Dec.
Tietzmann Tool Corp.—Mar., June
Timken Roller Bearing Co.—Feb., Mar., May, July, Sept., Nov.
♦*Tomkins-Johnson Co.—Feb., Mar., June, Aug., Oct., Dec.
*Torit Mfg. Co.—Oct., Dec.
*Torrington Co.—Feb., Apr., June, Aug., Oct., Dec.
*True-Trace Sales Corp.—July, Sept.
Tru-Seal Division, Flick-Reedy Corp.—Oct.
*Twentieth Century Mfg. Co.—Feb., Apr., June, Aug., Oct., Dec.

U

*Uddeholm Co. of America, Inc.—Jan., Mar., May, June, Sept., Nov.
*Union Carbide Corp., Bakelite Co., A Div.—Mar., June, Sept., Dec.
*Union Carbide Corp., Haynes Stellite Co., A Div.—Feb., Mar., June, July, Oct., Dec.
*Union Carbide Corp., Linde Co., A Div.—July, Aug., Sept., Oct., Nov.
Union Twist Drill Co., Butterfield Div.—Jan., Mar., May, July, Sept., Nov.
Union Twist Drill Co., S. W. Card Div.—Feb., Mar., Apr., June, Oct., Dec.
Union Twist Drill Co., Union Div.—Jan., Mar., Apr., June, Oct., Dec.
United Scientific Co., Unitron Div.—Nov., Dec.
U. S. Drill Head Co.—Jan., Feb., Mar., Apr., May, June, Sept., Oct., Nov., Dec.
U. S. Hoffman Machinery Co.—Oct.
♦U. S. Industries, Inc., Clearing Machine Corp., Div.—Jan., Mar., June, Sept., Nov.
*U. S. Rubber Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept.
*U. S. Tool Co., Inc.—Jan., Mar., May, July, Sept., Nov.
Universal Eng. Co.—Jan., Mar., May, July, Sept., Nov.

V

Vaill Eng. Co.—Jan., Feb., Mar., Apr., May, Sept., Nov.
*Valenite Metals Corp.—Mar., Aug., Nov.
*Van Keuren Co.—Jan., Mar., May, June, Sept., Nov.
Van Norman Industries, Inc., Morse Twist Drill & Machine Co., Subs.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Van Norman Industries, Super Tool Co., Subs.—Mar., Apr., May, Oct., Nov.
*Vanadium-Alloys Steel Co.—Jan., Apr., June, Aug., Oct., Dec.
*Vascoloy-Ramet Mfg. Corp.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Veet Industries, Inc.—Sept., Nov.
Verson AllSteel Press Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Vibratory Feeder Co., Div. Automation Devices, Inc.—Apr., July, Nov.
*Vlier Eng., Inc.—Jan., Feb., May, June, Sept., Oct., Nov.
Von Arnould, W., Co.—Sept.
Vulcan Crucible Steel Division, H. K. Porter Co., Inc.—Jan., Mar., May, July, Sept., Nov.
*Vulcan Tool Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

W

*Wadell Equipment Co.—Feb.
♦*Waldes Kohinoor, Inc.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
*Wales-Strippit Co.—Jan., Mar., May, July, Sept., Nov.
Walker, O. S., Co., Inc.—Feb., Apr., June, Aug.
*Walker-Turner Division, Rockwell Mfg. Co.—Feb., Apr., June, Aug., Oct.
Wallace Supplies Mfg. Co.—July, Aug., Sept., Oct., Nov., Dec.
Walsh Press & Die Co., Ind. Div., American Gage & Machine Co.—Mar.
Ward Machinery Co.—Mar., July, Nov.
*Warner & Swasey Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Waukesha Cutting Tools, Inc.—July
*Webber Gage Co.—Mar., May, Aug., Nov.
*Wells Mfg. Co.—Feb., Mar., June, Aug., Oct., Dec.
Wendt-Sonis Mfg. Co.—Mar., Apr., May, Sept.
*Wesson Co.—Feb., Apr., June, Aug., Oct., Dec.
♦*West Point Mfg. Co.—Feb., Apr., June, Aug., Oct., Dec.
Westinghouse Electric Corp.—Jan., Mar.
Whistler, S. B., & Sons, Inc.—Feb., Apr., June, Aug., Oct., Dec.
Whitman & Barnes, Inc.—Feb., Apr., June, Oct., Dec.
*Whitney Chain Co., Hanson-Whitney Div.—Feb., Apr., June, Aug., Oct., Dec.
*Whitnon Mfg. Co.—July, Sept., Nov.
Wiedemann Machine Co.—Jan., Mar., May, July, Sept., Nov.
*Willey's Carbide Tool Co.—Mar., Apr.
♦*Wilson Mechanical Instrument Div., American Chain & Cable Co.—Jan., Mar., May, July, Sept., Nov.
*Wilton Tool Mfg. Co.—Jan., Mar., May, July, Sept., Oct.
♦Winter Bros., Division National Twist Drill & Tool Co.—Feb., Apr., June, Aug., Oct., Dec.
Wintriss, Inc.—Oct.
*Wisconsin Drill Head Co.—Jan., Mar., July, Oct.
Wohlnip, Inc.—July
Woods, S. A., Machine Co.—Apr.
Woodson Tool Co.—Feb., June, Sept., Dec.
*Woodworth, N. A., Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.
Wye-Stanley Tool Co.—Jan.

Y

Yoder Co., The—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

Z

*Zagar, Inc.—Feb., Apr., Sept.
Ziegler, W. M., Tool Co.—Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct., Nov., Dec.

Index of THE TOOL ENGINEER Advertisers

December 1957 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

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A

A & C Engineering Co. ... 232
*Adamas Carbide Corp. ... 265
Air-Mite Devices, Inc. ... 222
Alina Corp. ... 199
*Allegheny Ludlum Steel Corp. ... 206
Allen Mfg. Co. ... 69
♦*Allied Products Corp., Richard Bros. Punch Division ... 233
American Broach & Machine Co., Division of Sundstrand Machine Tool Co. ... 66-67
♦*American Drill Bushing Co. ... 17
American Society of Tool Engineers ... 161, 190
American Tool Works Co., The ... 11
♦ Anker-Holth Division ... 237
Armstrong-Blum Mfg. Co. ... 195
Austin Industrial Corp. ... 225
*Automation Devices, Inc., Perry Equipment & Engineering Co. ... 22

B

*Bakelite Co., A Division Union Carbide Corp. ... 54
Balas Collet Mfg. Co. ... Back Cover
Baldwin-Lima-Hamilton, Hamilton Division ... 48
Bay State Tap & Die Co. ... 57
Bellows Co., The ... 220
Bethlehem Steel Co. ... 211
*Blake, Edward, Co. ... 214
Blanchard Machine Co., The ... 58
*Bliss, E. W. Co. ... 43
Bodine Corp., The ... 212
Borg-Warner Corp., Rockford Clutch Division ... 156
Boston Gear Works ... 27
Bridgeport Brass Co. ... 261
♦*Bristol Co., The ... 222
*Brown & Sharpe Mfg. Co. ... 34, 180, 257
*Bryant Chucking Grinder Co., Bryant Gage & Spindle Division ... 181
♦*Buck Tool Co. ... 199
Buhr Machine Tool Co. ... 208-209

C

*Carborundum Co., The, Stupakoff Division ... 197
Card, S. W., Division, Union Twist Drill Co. ... 23
Carlton Machine Tool Co., The ... 210
*Carpenter Steel Co., The ... 264
Carr Lane Mfg. Co. ... 262
*Chicago Rivet & Machine Co. ... 149
Cincinnati Grinders, Inc. ... 51
Cincinnati Milling Machine Co., Heald Machine Co., Subsidiary ... Inside Front Cover
Circular Tool Co., The ... 185
Clark, Robert H., Co. ... 256
Colonial Broach & Machine Co. ... 55-56
Comtor Co. ... 252
Cone Automatic Machine Co., Pilot Division ... 16
Continental Tool Works Division, Ex-Cell-O Corp. ... 213
Cosa Corp. ... 50
Covel Mfg. Co. ... 232
*Crafts, Arthur A., Co., Inc. ... 194
Cross Co., The ... 12-13
*Crucible Steel Company of America ... 224
*Cushman Chuck Co. ... 203

D

Deakin, J. Arthur & Son ... 256
Dearborn Gage Co., Ellstrom Standards Division ... 189
*DeVlieg Microbore Division, DeVlieg Machine Co. ... 29
♦*DoALL Co. ... 250
*Dow Chemical Co., The ... 244
*Dumore Co., The ... 240
Dykem Co., The ... 214

E

*Eastman Kodak Co. ... 207
*Eclipse Counterbore Co. ... 169
Ellstrom Standards Division, Dearborn Gage Co. ... 189
Ex-Cell-O Corp. ... 53, 205, Inside Back Cover
Ex-Cell-O Corp., Continental Tool Works Division ... 213

F

*Federal Products Corp. ... 14-15
*Firth-Sterling, Inc. ... 35
Foote-Burt Co., The ... 200

G

*Gaertner Scientific Corp. ... 190
Gardner-Denver Corp., Keller Tool Division ... 38
*General Electric Co., Metallurgical Products Dept. ... 36-37, 218
Gisholt Machine Co. ... 30-31
Greaves Machine Tool Co. ... 187
Greenfield Tap & Die Corp. ... 247
*Greenfield Tap & Die Corp., Horton Chuck Division ... 229
Greenlee Bros. & Co. ... 28
Grob, Inc. ... 236
Gulf Oil Co. ... 62-63

H

Hamilton Division, Baldwin-Lima-Hamilton ... 48
*Hammond Machinery Builders, Inc. ... 167
*Hannifin Corp. ... 68
*Hanson-Whitney Division, The Whitney Chain Co. ... 184
*Hardinge Brothers, Inc. ... 5
*Haynes Stellite Co., A Division Union Carbide Corp. ... 217
Heald Machine Co., Subsidiary Cincinnati Milling Machine Co. ... Inside Front Cover
*Heller Tool Co., Subsidiary, Simonds Saw & Steel Co. ... 32-33
Hoggson & Pettis Mfg. Co. ... 236
*Horton Chuck Division, Greenfield Tap & Die Corp. ... 229

J

J & S Tool Co., Inc. ... 172
Jahn, B., Mfg. Co., The ... 153
*Jarvis Corp., The ... 191
Jersey Mfg. Co. ... 256
*Jones & Lamson Machine Co. ... 204

K

Keller Tool Division, Gardner-Denver Corp. ... 38
*Kennametal, Inc. ... 260
Kingsbury Machine Tool Co. ... 223

L

*Lamina Dies & Tools, Inc. ... 159
*Landis Machine Co. ... 8
*Lapeer Mfg. Co. ... 164
Lapointe Machine Tool Co. ... 170
*Latrobe Steel Co. ... 41
Lavallee & Ide, Inc. ... 175
*Lee, K. O., Co. ... 202
Leland-Gifford Co. ... 176
Lepel High Frequency Laboratories ... 178
*Lindberg Engineering Co. ... 226
*Lodding, Inc. ... 160
Lodge & Shipley, Inc. ... 234

M

*Mall Tool Co., Division, Remington Arms Co., Inc. 215
*Manhattan Rubber Division, Raybestos Manhattan, Inc. 40
Melin Tool Co., Inc. 155
*Metal Carbides Corp. 214
Metal Treating Institute 192
*Metallurgical Products Department, General Electric Corp. 36-37, 218
*Meyers, W. F., Co. 222
♦*Micrometrical Mfg. Co. 186
*Moore Special Tool Co. 196
Morris, Robert E., Co. 168
Morse Twist Drill & Machine Co., Subsidiary, Van Norman Industries, Inc. 46-47
*Motch & Merryweather Machinery Co., The 19

N

National Automatic Tool Co., The 44-45
*National Broach & Machine Co. 42
♦ National Twist Drill & Tool Co. 6-7
Nebel Machine Tool Co., Smith & Mills Shaper Division 214
New Britain Machine Co., The 248-249
New York Twist Drill Co. 161
Norton Co., Abrasive Grinding Wheel Division 259
Machine Division 20-21

O

*Oakite Products, Inc. 171
*Ohio Crankshaft Co., Inc. 70
*O. K. Tool Co., Inc. 255
Olofsson Corp. 182
Onsrud Machine Works 219
Opto-Metric Tools, Inc. 286
♦*Ortman-Miller Machine Co. 148
*Osborn Mfg. Co. 26

P

*Pacific Ind. Mfg. Co. 268
*Pangborn Corp. 236
Parkwood Laminates, Inc. 270
Penn Eng. & Mfg. Co. 175
*Perry Equipment & Eng. Co., Division Automation Devices, Inc. 22
Pilot Division, Cone Automatic Machine Co. 16
*Pioneer Aluminum, Inc. 241
Pipe Machinery Co. 263
*Producto Machine Co., The 238
*Putnam Tool Co., The 60

R

*R and L Tools, Inc. 253
*Raybestos-Manhattan, Inc., Manhattan Rubber Division 40
Rehnberg-Jacobson Mfg. Co. 269
Reichhold Chemicals Co. 49
*Remington Arms Co., Inc., Mall Tool Co., Division 215
♦*Richard Brothers Punch Division, Allied Products Corp. 233
Ring Punch & Die Co. 152
Robbins, Omer E., Co. 188
Rockford Clutch Division, Borg-Warner Corp. 156
*Russell, Holbrook & Henderson, Inc. 235
*Ryerson, Jos. T., & Son, Inc. 72

S

*Schrader's, A., Son 9
Seneca Falls Machine Co. 251
*Service Machine Co. 232
Sheffield Corp., The 242
Shell Chemical Corp. 266
*Shell Oil Co. 243
*Simonds Saw & Steel Co. 231
*Simonds Saw & Steel Co. Heller Tool Co., Subsidiary 32-33
*Simplex Corp. 254
Smith & Mills Shaper Div., Nebel Machine Tool Co. 214
*Standard Gage Co., Inc. 18
Standard-Modern Tool Co., Ltd. 230
*Standard Parts Co. 166
*Standard Pressed Steel Co. 10, 267
Standard Tool Co. 39
Stanley Aviation Corp. 252
♦*Starrett, L. S., Co., The 221
*Stupakoff Division, The Carborundum Co. 197
Sun Oil Co. 2
Sundstrand Machine Tool Co. 64-65
Sundstrand Machine Tool Co., American Broach & Machine Co., Division 66-67
*Superior Steel Products Corp. 258
*Syntron Co. 158

T

Taft-Peirce Mfg. Co. 61
Thompson Grinder Co. 239
Threadwell Tap & Die Co. 4
Thriftmaster Products Co. 202
♦*Tomkins-Johnson Co. 198
*Torit Mfg. Co. 162
*Torrington Co., The 52
*Twentieth Century Mfg. Co. 154

U

*Union Carbide Corp., Bakelite Co., A Division 54
Haynes Stellite Co., A Division 217
Union Twist Drill Co., S. W. Card Division 23
Union Division 216
United Scientific Co., Unitron Division 256
U. S. Drill Head Co. 227

V

Van Norman Industries, Inc., Morse Twist Drill & Machine Co., Subs. 46-47
*Vanadium-Alloys Steel Co. 201
*Vascoloy-Ramet Mfg. Corp. 150
Verson Allsteel Press Co. 228
*Vulcan Tool Co. 57, 202

W

♦*Waldes Kohinoor, Inc. 59
Wallace Supplies Mfg. Co. 146
*Warner & Swasey Co. 24-25
*Wells Mfg. Co. 270
*Wesson Co. 245-246
♦*West Point Mfg. Co. 256
Whistler, S. B. & Sons, Inc. 252
Whitman & Barnes, Inc. 165
*Whitney Chain Co., Hanson-Whitney Division 184
♦ Winter Bros. Division, National Twist Drill & Tool Co. 6-7
Woodson Tool Co. 252
*Woodworth, N. A., Co. 179

Y

Yoder Co., The 163

Z

Ziegler, W. M., Tool Co. 262

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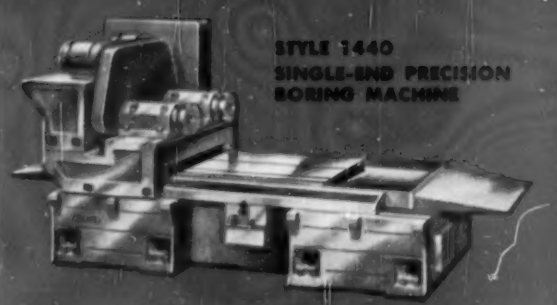

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